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The Gaskill Pumping Engine at Kalamazoo, Mich.

The engravings, which we present herewith, represent the pumping engine, recently erected at the above-named place by the Holly Manufacturing Company, of Lockport, N. Y. For special reasons, this engine is of the vertical type, but the same principles are involved in its construction as in the horizontal engines built by this company.

The steam pistons travel simultaneously in opposite directions, and the valve action has, although being a modification of what is known as the "Corliss," the same effect in the steam distribution as the valve action of the horizontal engine. This engine was designed for the same service as the overhead beam engine. The steam cylinders being vertical, the pumps can be placed at any desired distance below the engine-room floor, in order to accommodate the engines to situations where the water or the source of supply has a fluctuating level.

The pumps have single-acting plungers, one being placed under each steam cylinder, with outside packing and separate valve boxes. Double-acting plungers can be used, however, equally well with this type of engine, and in some situations might be preferred.

The beam is of peculiar construction, being made with side pieces of heavy steel plate, with cast-iron hubs bolted in for the reception of the center shaft and connection pins. The main connecting rod pin is located on the lower side of the beam at a point which secures the proper vibration of the rod. This position of the pin is rendered necessary by the peculiar location of the shaft, which is placed quite close to the steam cylinders, this arrangement giving ample length of rod. The main crank shaft is located between bearings on the frame, and two overhanging flywheels are keyed to the outer ends of the shaft.

The base casting being in one piece, and all of the engine parts being attached to it, renders the engine self-contained and rigid. The strains between the engine and pumps are taken up by straight wrought-iron struts, which are securely fastened to the engine frame above and to the pumps below.

The specifications under which this engine was built provided for a daily capacity of 3,000,000 gallons against a head of 120 feet, and a fire pressure of 130 pounds per square inch, at a piston speed of 130 feet per minute.

The specified duty was 95,000,000 foot pounds per 100 pounds of coal; the boiler pressure to be 70 pounds gauge pressure.

The following are the principal dimensions of the engine, and an account of the trial:

Plunger driven by H. P. steam piston.

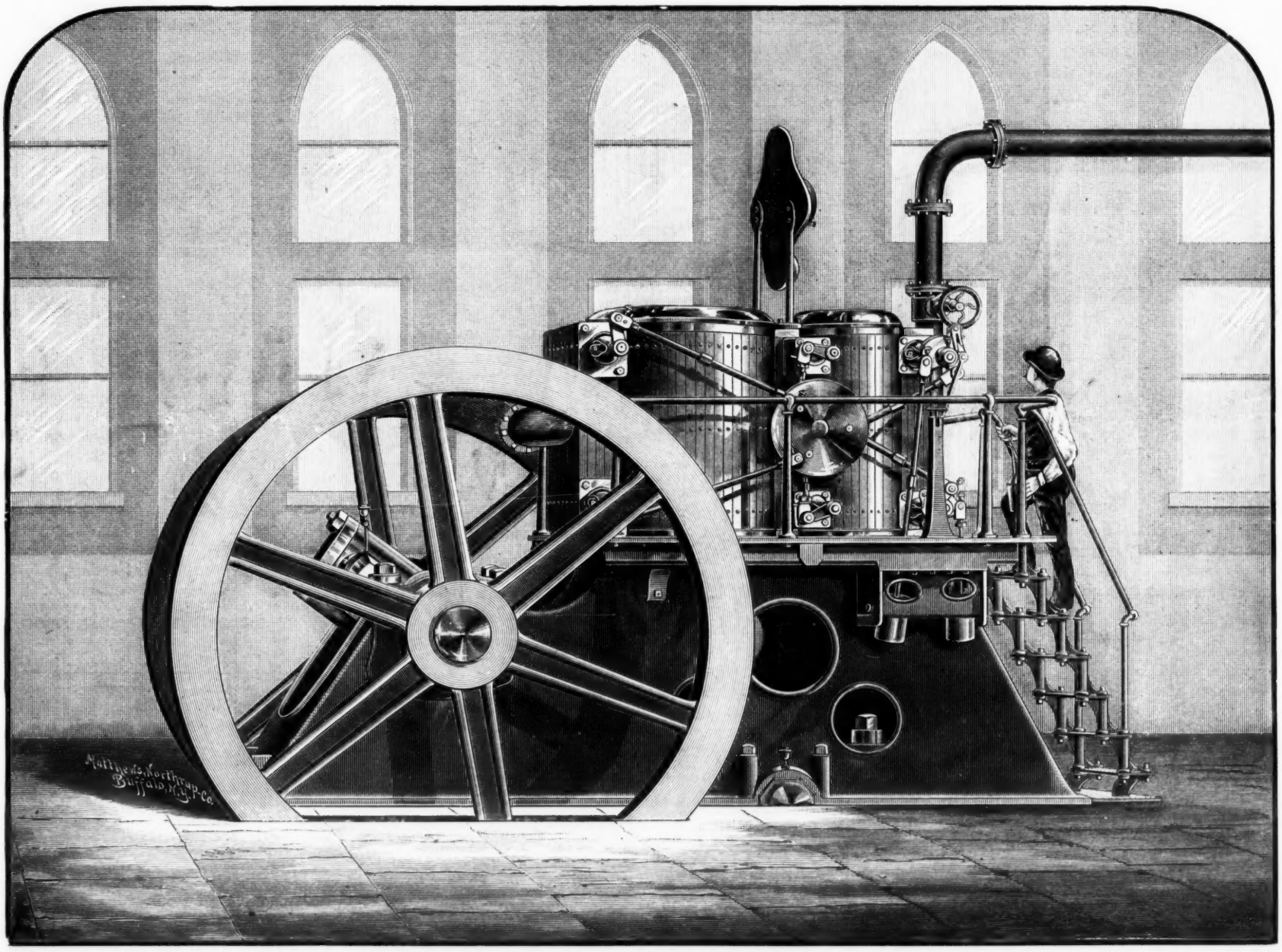
Diam., ins.....20.03125
Stroke, ins.....29.96875
Plunger driven by L. P. steam piston.
Diam., ins.....20.03125
Stroke, ins.....29.922

The other principal dimensions of the engine are as follows, taken from contractor's drawings, except steam piston rods, which were measured:

H. P. steam cylinder, diam....18.0 ins.
L. P. steam cylinder, diam....36.0 ins.
Stroke steam pistons (nominal).....30.0 ins.
H. P. piston rod (1) diam.....2.625 ins.
L. P. piston rod (2) diam.....3.4375 ins.
Clearance H. P. cylinder (estimated).....2.5 per cent.
Clearance L. P. cylinder (estimated).....2.5 per cent.

Steam cylinders, jacketed sides and heads, with sides lagged with walnut staves, and upper heads finished with polished covers.

Crank shaft, diam.....12.0 ins.
Crank pin, diam.....12.0 ins.
Fly wheels, two in number.
Fly wheels, diam.....10.0 feet.



THE GASKILL PUMPING ENGINE AT KALAMAZOO.

Fly wheels, weight (each).....8,000 pounds.

Air pumps, two single-acting, worked from pins at ends of an even lever-working beam mounted on an extension of the engine beam shaft.

Air pump, diam.....11.0 ins.
Air pump, stroke.....14.0 ins.

Boiler feed pumps are of the single-acting plunger style, two in number, worked from an even lever beam keyed on the extension of engine beam shaft, outside the beam by which the air pumps are driven.

Feed pumps, diam..... 3.00 ins.
Feed pumps, stroke..... 7.25 ins.

Pumps are fitted with four sets of small single beat rubber valves, mounted in composition shells, and working on composition

seats screwed into the diaphragms of valve chambers.

Each set contains 91 valves, or 364 valves in the suction and discharge chambers of both pumps.

Pump valves, diam. disk.....	1.75	ins.
Pump valves, diam. opening in seat.....	1.3125	ins.
Pump valves, lift.....	0.3125	ins.
Pump valves, thickness of disk.....	0.50	ins.

The valves are guided above the seat by the stem (which moves with the disk), passing through a hub in a three-winged cage, which screws down over a threaded projection of the seat outside the valve disk.

The lift of pump valve presents a clear opening between the disk and seat of 1.718 sq. ins., while the area through the seat (which is the full area for diam.), is 1.353 sq. ins.

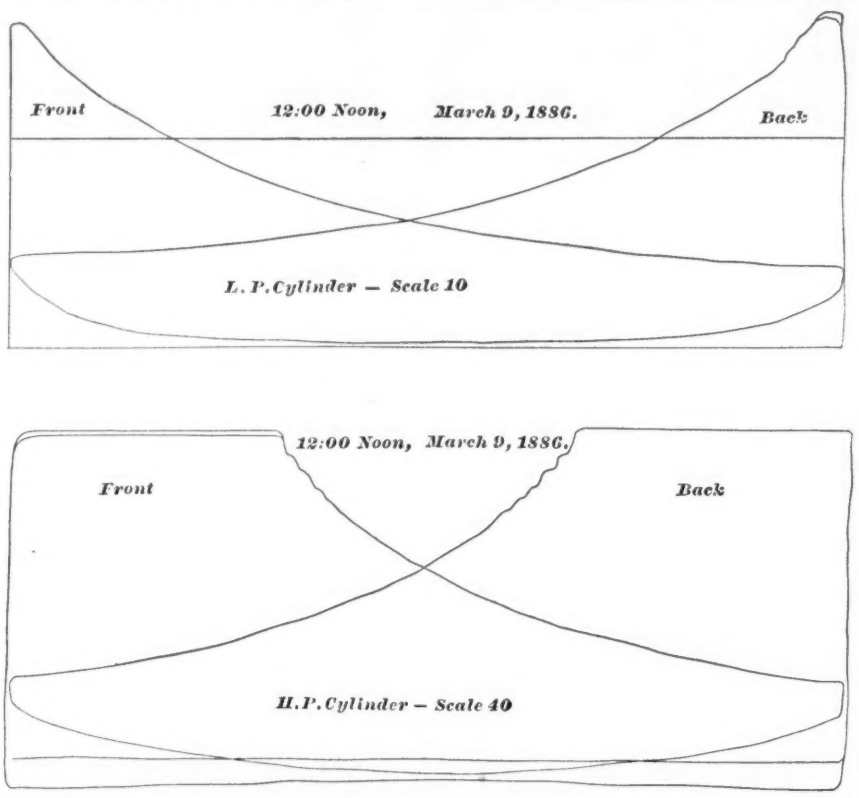
The velocity of flow through the seats with plungers moving at the rate of 130 feet per minute,

$$\frac{130 \times 315.1425}{123.123 \times 60} = 5.547 \text{ ft. per second.}$$

The pumps take water from a curbed well outside.

DUTY TRIAL.

The trial for duty commenced at 11 A. M., March 9, and ended at 11 A. M., March 10,



Engine counter at 11 A. M., March 9.....	149986
Engine counter 11 A. M., March 10.....	188188
Revolutions in 24 hours	38202
Revolutions per minute	26.5292
Piston speed per minute....	132.407

Area of plungers (each),
$20.03125^2 \times 0.7854 = 315.1425$ sq. ins.

Plunger travel per revolution of engine

$$\frac{29.96875 + 29.922}{12} = 4.991 \text{ feet.}$$

And duty developed

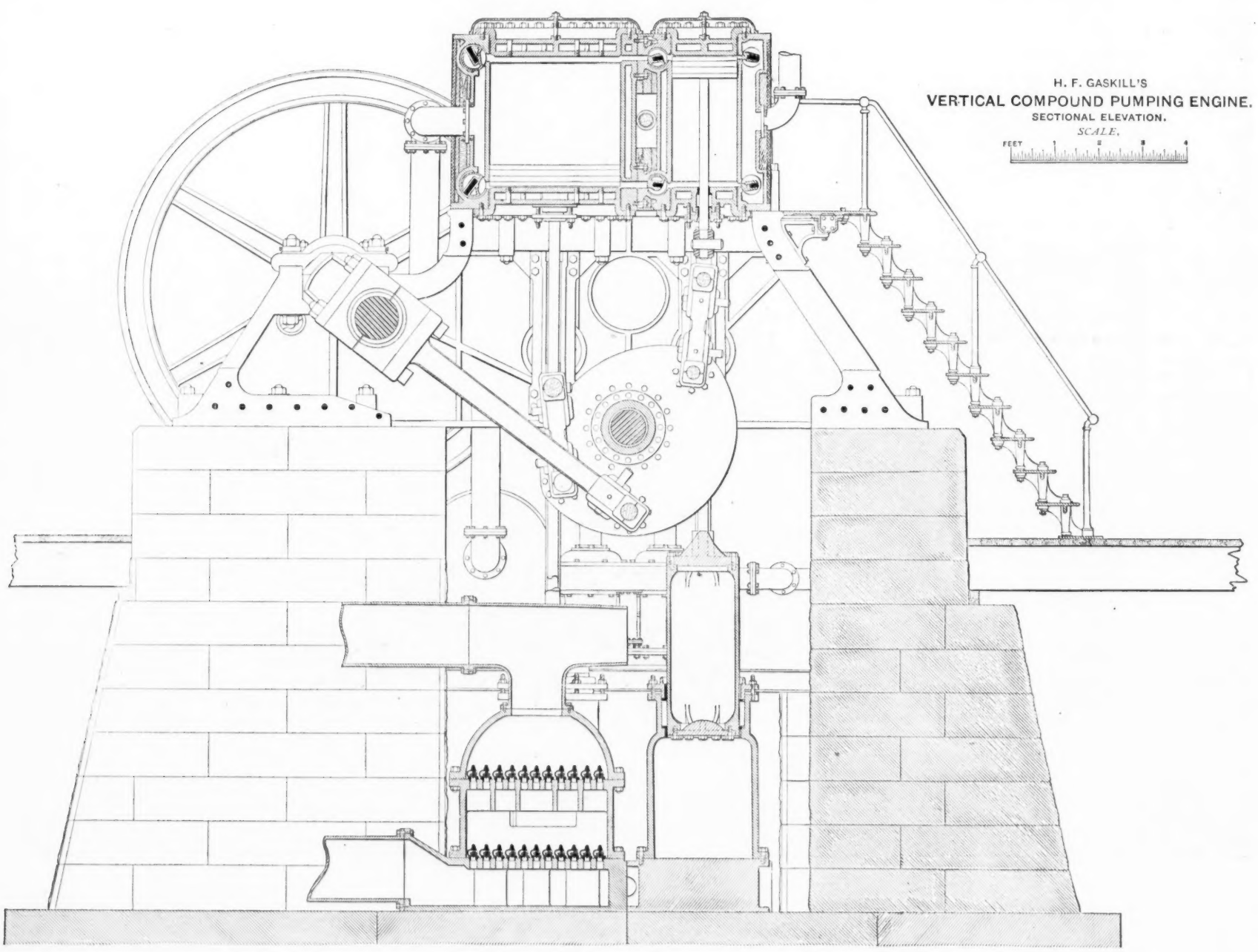
$$\frac{315.1425 \times 4.991 \times 59.8384 \times 38202}{3500} = 102{,}728{,}884.96$$

foot pounds.

The specification and agreement guarantee a duty of 95,000,000 foot pounds per 100 pounds of coal burned, which is exceeded in the actual performance of the engine by nearly 8,000,000 foot-pounds,

The means of the data taken during the duty trial are as follows:

Duration of trial, hours.....	24.	
Pressure of steam at boiler...	72.062	lbs.
Pressure of steam at engine.	71,287	lbs.
Level of water in boiler at 11 A. M., March 9.....	7.00	ins.
Level of water in boiler at 11 A. M., March 10.....	6.875	ins.



embracing an uninterrupted operation of the engine under nearly uniform conditions of steam pressure, water pressure and speed, for a period of 24 hours. During this time the coal fired was 50 charges of 70 lbs.

Total coal fired.....	3500.	lbs.
Ash, clinker and waste from ash pit at end of trial.....	158.5	lbs.
Percentage of non-combustible.....	4.53	lbs.

The grate bars were of the rocker pattern, and these were worked frequently to clear the fire of clinker and ash during the trial. The fires were cleared of ash and clinker at beginning of trial, and the ash pit raked clean. The fires were of same thickness and in same condition, as nearly as could be judged from careful observation, at the beginning and at the end of trial.

The condition and thickness at beginning was observed and entered in the writer's notes at the time, and the same condition and thickness was restored at the end of trial.

The average head pumped against during the trial was 59.8384 lbs., as follows:

Average pressure by water pressure gauge.....	42.7057	lbs.
Correction of gauge.....	1.0000	lbs.
Corrected gauge pressure...	43.7057	lbs.
Average difference of levels cen. of W. P. gauge and level of water in pump well, cen. of water pressure gauge to bench mark	18.00	ft.
B. M. to surface of water in well.....	16.9263	ft.
Pressure due diff. of levels	15.1327	lbs.
Add allowance for frictional resistances of pumps..	1.000	lbs.
Total head.....	59.8384	lbs.
Total head.....	138.106	ft.

Level of water in boiler, mean for trial.....	7.0332	ins.
Vacuum by gauge observed.	25.8630	ins.
Vacuum by gauge corrected.	24-345	ins.
Vacuum by gauge corrected.	11.951	lbs.
Temperature of feed water observed.....	171.344	
Temperature of feed water corrected.....	168.344	
Temperature of injection observed.....	50.937	
Temperature of injection corrected.....	49.937	

Temperature of overflow, observed	93.156
Temperature of overflow, corrected	91.656
Temperature of air, engine room	73.23
Barometer, inches	29.466
Barometer, pounds	14.465

It was held that the contract requirement of the pumps had been complied with, and the duty, as seen, was in excess of the requirements.

The tests were made by John W. Hill. The indicator diagrams shown are copies of some taken during the trial.

Newark No. 3, N. A. S. E., publicly opened their new hall Monday evening, April 26. Several leading manufacturers were present. Mr. Cozens, for the association, explained the objects and aims of the association, and short speeches were made by some of the invited guests. After spending an hour or so in the hall, the members and invited guests sat down to a collation, at which several speeches were made by the guests. Newark manufacturers are taking a good deal of interest in the affairs of the association in various ways.

Device for Turning Wrist Pins.

The device which the accompanying engravings represent is used at the Brainerd shops of the Northern Pacific Railroad. It was devised by O. H. Reynolds, chief draftsman, and Mr. McNaughton, a foreman in the shops. It is not patented. Mr. Reynolds furnishes us with the following description:

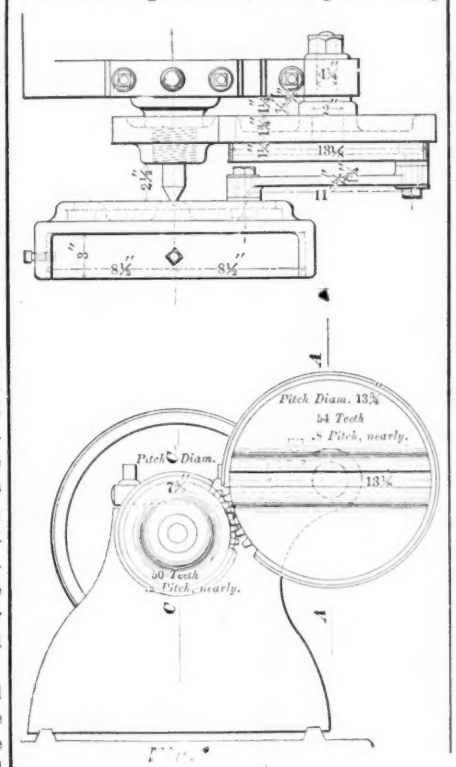
Previous to the introduction of this machine the wrist pins were finished by swinging the crosshead on the lathe centers, the motion being given to it by means of a lever driven in the hole cored for the piston rod and operated by a helper.

Not more than 12 strokes per minute could be made by the operator and the work done in this way was not first class; to overcome these deficiencies the machine represented was devised. One wing of the crosshead is held in the proper position by set screws in a chuck, Fig. 2, swinging on the live center of the lathe, while the other wing is similarly held in a chuck (not shown, but exactly like Fig. 2) swinging on dead center. A vibatory motion is given to the chucks and crosshead by means of a pitman, Fig. 3, which is attached at one end to the chuck on the live center, at the other end to a revolving slotted gear wheel, which is journaled on a pin secured to one of the bearings of the back gear which is temporarily removed for the purpose. The slotted wheel receives its motion from a gear attached to the live spindle.

The arc of vibration of the chucks and crosshead can be increased or diminished by moving the revolving pin from or towards the center of the slotted wheel.

The turning is done with a goose neck tool as before. When one half of the pin is finished the crosshead is reversed in the chucks and the operation repeated on the other half.

The operation of turning takes only a third as long as before, the service of the helper is dispensed with and the finish is first class.



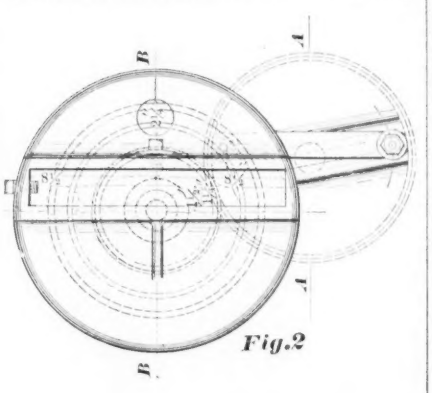


Fig.2

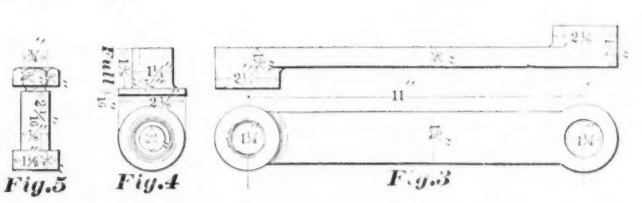


Fig.5 Fig.4 Fig.3

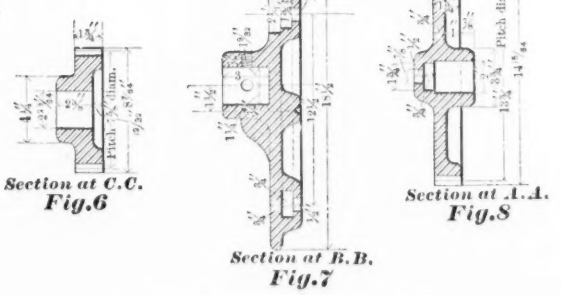


Fig.6 Fig.8 Fig.7

DEVICE FOR TURNING WRIST PINS.

Babbitting Solid Boxes.

Shrinking of metal, causing the babbitt to be loose in the box, is a serious objection which has to be overcome before a perfect whole or "solid" box can be successfully made, by lining cast iron with babbitt metal.

In making half boxes, it is easy to caulk the metal tight into the casting by hammering thoroughly the entire surface of the babbitt metal. By the action of the hammer (preferably a round faced one) the metal is swaged until it fills every corner and hole of the rough casting.

In the whole box, there is no chance for hammering, that is, in a small box, and many means have been tried for securing tight lining for the same.

Tinning the interior of the box, causes the lining to become soldered to the iron, and answers fairly well, still there must be excessive strains constantly present, as the lining desires to shrink, but is prevented by being firmly held to the iron box. Heating the box has also been tried, sometimes with good effect, especially if the box is heated hot enough to keep the babbitt in a melted state, and then both box and babbitt lining are allowed to cool together.

Mixing a certain amount of antimony with the lining composition will cause the metal to expand as it solidifies, thus filling every indentation of the box. For a cheap lining, this answers very well, but the alloy thus formed is type metal instead of babbitt.

Some manufacturers swage the box after lining instead of boring. They force a mandrel through the box, forcing the lining into contact with the casting, and finishing the bearing surface at the same time.

This method makes the best box, but an engineer suggests that the experiment be tried of spinning the metal to fill the box, instead of swaging it. He proposes to chuck the box on face plate of an ordinary lathe.

Then with a round-nosed tool, which has been highly polished, he will spin the babbitt lining against the interior of the box.

It is also suggested that the tool be fitted with a revolving ball shaped end, which will act upon the lining with rolling-mill effect, and which it is expected will give good results in making a box of this kind.

A handy device for facing up cylinders is made by clamping an arm to the sliding collar of an ordinary cylinder bar. The arm has a tool post attached to it by means of a gibbed slide and feed screw, similar to the cross-feed of an ordinary slide rest. By turning the feed screw of this arm, as it makes each revolution the cylinder may be faced a distance equal to the traverse of tool on the arm above mentioned.

Gray Iron vs. Forged Fittings.

An American mechanical engineer, who is well posted in the design and construction of machinery for the manufacture of steam fittings, has received a proposition from an English firm who want him to come to England and aid them in fitting up their factory and equipping it with machinery to manufacture fittings on the American plan. Our informant thinks this looks as if the English were coming to see the advantage of changing over from the old-fashioned forged and malleable fittings, to the light gray iron fittings so largely used in this country. But can English manufacturers procure English iron that will work up as light and as strong as the American?

Brooklyn Shop Notes.

At the Clayton Pump Works, Brooklyn, N.Y., an air compressor has been made with a slotted crosshead, in which the friction was changed from sliding to rolling, by means of eight pulleys, each about three inches in diameter.

Four planed projecting lugs cast on the crosshead received the thrust of the piston rod, and momentum of the balance wheel through the above mentioned wheels, which were fitted to pins on the wrist-plate which usually slides in the crosshead.

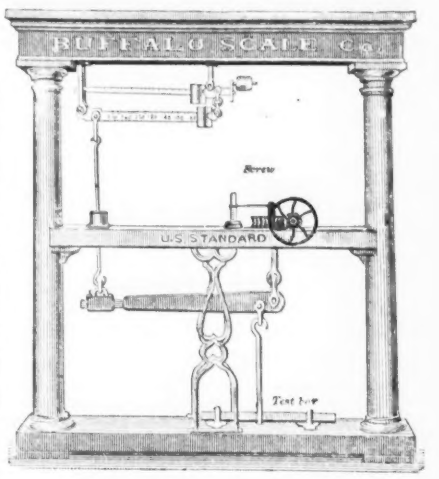
The crank was four and a half inches long, giving a throw of nine inches. The wheels being three inches in diameter, made about one revolution while they were under pressure. When the return stroke was commenced, the wheels revolved a little further by their own momentum, thus making sure that the same part of the wheel does not engage with the lugs during each revolution of the crank.

In the construction of the Clayton compressor, a double crank shaft is used. This shaft is forged. Both cranks are also forged on, and as the balance wheel must be placed between cranks, some method must be devised for getting the pulley over one of the cranks.

A split-pulley is the usual method of getting over such a difficulty; but to dispense with this undesirable factor, Mr. Clayton cast the hub of pulley with an extension between two of the pulley arms. This extension was slotted to enable the crank to pass through it. A plug is fitted to the slot before pulley is bored. The key-way being cut at an angle of 135 degrees with cranks, the extension hub serves as a counter-balance for weight of both cranks.

Foundry Testing Machine.

Our attention has been called by Bradley & Co., Syracuse, N. Y., to the machine here-



FOUNDRY TESTING MACHINE.

with illustrated for testing iron in the foundry. The firm named say they have used the machine for some time with entirely satisfactory results.

The machine is designed for applying transverse strains to one-inch square bars.

The person operating it puts on the strain by turning the wheel with the right hand, and moves the poises on the beam with the left hand. A boy ten years old can handle it without much effort. It has no loose weights. It has steel pivots and bearings, iron pillars and brass beams and poises.

The manufacturers are the Buffalo Scale Company, Buffalo, N. Y.

"Lancelot," asked Elaine, looking up from the *Eagle*, "How do the strikers 'kill' an engine? I can't understand it at all." "Easy as lying," replied Lancelot, promptly. "You just climb over the tail board into the cab, open the blow-off cock by lowering the connecting rods until the crank pin is level with the cross head of the fulcrum connections, push in the brass throttle ratchet till it reaches the crown sheet, which lets the water glasses fall into the fire box—" "Oh, now I see," she said, joyously, "and of course that puts out the fire. But Lancelot, if I knew as much about engines as you do, I wouldn't stand at the ribbon counter another day. I'd just go out to where the strike is, and be a president of the railroad myself." And Lancelot kissed her and said he would, just as soon as his new tennis suit came home.—*Burdette in the Brooklyn Eagle.*

"There are two ways to set the tail spindle of a small lathe," said a machinist. "One way is to slide the tailstock toward the work until it is in about the right position, then clamp it and adjust the spindle by means of the hand wheel."

"The best way is to find which part of the hand wheel or crank is the heaviest. Turn this part uppermost, so that when it gravitates downward it will tend to throw the center into the work. Slide the tailstock up to the work, enter the center and clamp tailstock. A very slight movement of the hand wheel will now adjust the center, and if the spindle clamp-screw gets loose the tail spindle cannot run back, leaving the work loose on the centers and liable to be spoiled if it catches on the tool."

Our next issue will contain much valuable matter.—*American Miller.*

What's the matter with the matter of your last issue?—*The Millstone.*

A machinist can do, to-day, not less than fifty per cent. more work than he could do 25 years ago.

According to *Engineering* the steamships Parthia and Batavia have been made much more economical by putting in triple expansion engines. The Parthia formerly burned 47 tons of coal a day of 24 hours in making 11 knots. During 1885-6 the consumption was 25 tons at same speed. The Batavia gives still better results, reducing from 40 tons for 11 knots to 21 tons.

Metal Spinning.

Metal spinning has been driven from the field, to a great extent, by the drop and roller presses; but for certain kinds of work no other known method will shape metal to so great an advantage as lathe spinner.

In making certain kinds of brushes, the handle is made of iron; the bristles are forced into a ferrule, which is in turn forced tight upon both bristles and iron handle, in a fraction of a minute, by the metal spinner.

Spinning metal is a very simple process. But few tools are needed. The two principal ones are shown by *a* and *b*, in the engraving.

In spinning, as with the drop press, the greatest trouble is in getting the mould ready. A wooden block may be chucked, turned to the required shape, as shown by *c*, and the metal forced to fit its members.

For articles of which a large number will be required, an iron mould or chuck should be made.

For holding some kinds of work, a cap is put on the tail spindle (a common speed lathe) and forced against the plate of metal, as at *f*.

In forming the metal, it is simply pressed into place by the tool *i*, which is fulcrumed against the pin *h*, whereby great power is brought to bear upon the metal plate *e*. The rest *j* has a number of holes drilled in its top, so that the pin *h* may be moved as desired.

As will be seen in the engraving, pressure is applied at the center first; then the tool is carried toward the outer edge of the work. In spinning up this shape, which we will call a brass cover for the end of a cylinder head, the metal will have a tendency to buckle at its outer edge, as at *e* and *j*. This is caused by the compressing action of the tool, when the metal is being turned around the corner of the mould, from *e* to *c*. This trouble may be remedied by holding a block of wood back of the metal *e*, at a point where the tool bears.

But two things are accomplished in metal spinning: the metal is either compressed, or it is drawn out.

This is shown at *h*. The tools *m* or *n* are moved from *h* toward *g* or *i*, and bear against the pin *j*. In this example, the metal is drawn out thin and covers more ground.

At *i*, the tool is shown compressing or upsetting the metal. The tool *l* bears against the pin *k*, and the metal is forced toward *i*. These two changes cover all the operations of lathe spinning, and by keeping them well in mind, the beginner will soon learn to put metal where he wants it.

A simple job can usually be done without removing the work from the lathe, but when much work is to be done, the metal (if brass or copper) should be annealed by heating to a dull red, and dropping into water while hot. The work should be annealed before being put upon the lathe.

The surface of the metal must be lubricated while spinning is being done, and for this purpose different substances are in use, some spinners using tallow, some soap, and others making use of peculiar compounds which only serve to lessen friction between tool and metal.

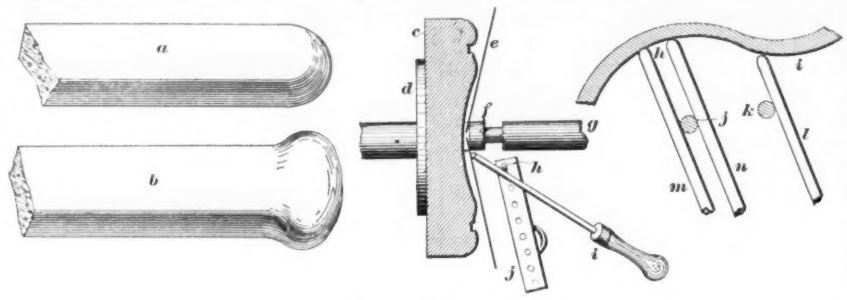
Tempering and Hardening—Boring Finished Holes.

A shell tap often proves a handy tool, but how to temper a shell tap in such a manner that it shall be of just the right degree of hardness, and still keep its shape, is a problem which some mechanics do not always solve to their satisfaction.

During a visit to the shop of T. R. Almond, Brooklyn, N. Y. (manufacturer of Almond's chuck) the method there used of tempering shell taps was explained to the writer, together with a number of valuable shop kinks described below.

The tap in question was about $1\frac{3}{4}''$ in diameter, and was bored to go on an arbor about $1\frac{1}{4}''$ in diameter. An arbor was procured which was slightly tapering, and on which the shell tap would slide a certain distance.

A dog was screwed on the arbor at the point where the shell would begin to stick as it slid over the arbor. This was done to stop the shell while hot from sliding farther down upon the arbor.



METAL SPINNING.

The arbor was placed perpendicularly in a tank of cold water, so that the dog was several inches below the surface.

When hot the shell was slipped upon the arbor and immediately slid down into the water. As soon as it was judged that the *teeth* of the tap were hardened, the arbor, with tap on it, was removed to the oil tank, and left therein until cold.

The arbor, in this case, served to guide the tap into the water in a perpendicular position,

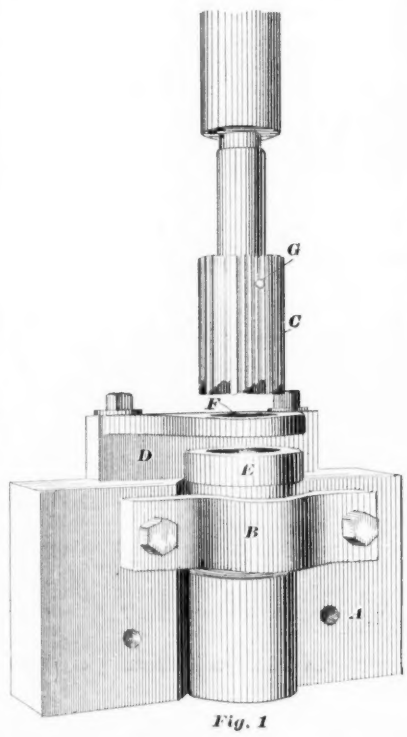


Fig. 1

and also to prevent the tap from shrinking out of shape while cooling.

Large reamers were also shown, which were hardened in a similar manner, except that the arbor was dispensed with and the reamer, clamped in a pair of blacksmith's tongs, was lowered into the tank by means of a cord passing over a pulley.

All articles to be thus hardened were heated in a lead bath, and the cord-and-pulley method was used for this purpose.

The shell tap, tempered by the above method, was as nearly perfect as a tap could well be made. The teeth were hard, yet the body of the tap could be readily cut with a file.

For all heating for hardening purposes, except what is done in lead, Mr. Almond uses a "muffle," whereby the direct flame and gas from the fuel does not come in contact with the articles to be heated.

In this shop a great number of small special tools are used, and the difficulty of keeping track of these tools when not in use has been met by providing small boxes, wherein each set of tools is kept. These boxes are about 12″ long, 6″ wide and 3″ deep. They are fitted with neat sliding covers, and each box is plainly marked with the name of tools kept therein. This method of keeping tools has not yet been reduced to a system, as a method of and place for keeping the boxes has not been provided.

A number of tools have been made by Mr. Almond for boring and finishing a hole in cast iron, with but once passing a tool through the work. Fig. 1 shows a tool of this class, as applied to a drill press in actual work.

A is a cast-iron knee, which is to be bolted to the faceplate; *E* is the work held by the strap *B*. A guide *D* has a hole at *F*, which allows the tool *C* to pass through without lost motion. This tool is made to be put on an ordinary spindle, and is held by the pin *G*.

The shank *E*, Fig. 2, holds the tool in the drill spindle in the ordinary manner, and may be made to fit a lathe, if desired.

The difficulty to be overcome in finishing a hole at one cut lies in the trouble of getting rid of the *dust* which is made by the tool.

The dust packs at *B* and binds the tool, causing trouble at once. To remedy this defect, the grooves are cut, as shown at *B*, with a view of reducing the surface, and to allow space for the chips and dust.

All cutting is done by the eight lips, like *A D* or *B C*, and it is believed improvement would be made by cutting away all metal on sides of tool, between cutting points.

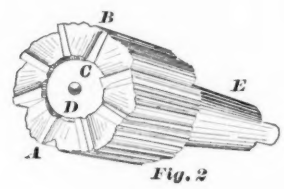
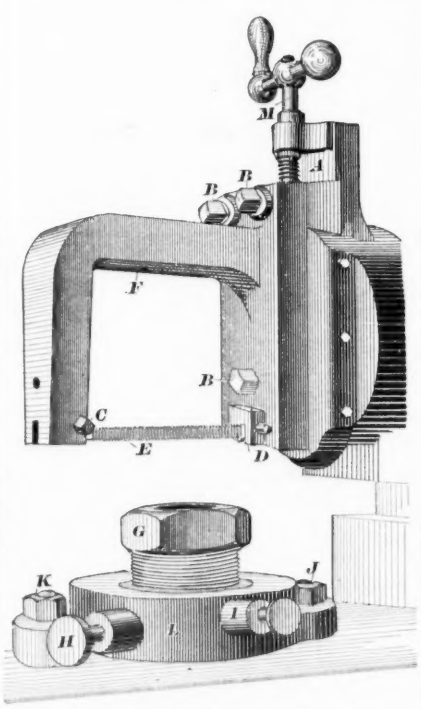


Fig. 2

To do accurate work with this tool, it is necessary that the cutting edges be perfectly straight from *A* to *B*.

This tool may be likened to a cannon, or



CUTTING RECTANGULAR HOLES.

"hog-nose drill," having eight cutters instead of one; but they must all be square with sides of tool.

Cutting Rectangular Holes on a Shaper.

A device for use on a shaping machine, by which rectangular holes may be quickly worked out, is in everyday use by the Leib Machine Company, 27 Vandewater street, New York City. The cut shows shaper head *A*, with the rig attached. *F* is a casting made fast to the head *A* by the bolts *B B B*.

The work may be bolted to the table in the usual manner, or, as in the case where a number of slots are to be finished at an angle to one another, the chuck *G* is fastened to the table by the bolts *J*. *K*. This chuck is made to fit several lathes and drill presses in the shop, and is a valuable tool in any shop.

The chuck *G* revolves in the casting *L*, and is drilled to receive the pin *H* at nearly any part of its revolution, thus making an index plate or dividing head of it.

When in position, it is locked by the set screw *I*, as shown in the engraving. The ends of these set screws are tapered. They engage with an annular groove in chuck *G*, holding it securely in any position.

The cutting is done by the tool *E*, which is held in place by pins *C* and *D*. This tool is of peculiar construction. It resembles a file, or an old-fashioned wood rasp or "riffler."

The tool shown in this instance is about $\frac{7}{16}''$ square, having twelve teeth per inch on all four of its sides.

It will readily be seen that, by adjusting the stroke of shaper to length of tool and thickness of work, and by means of different movements of table and head *A*, the work in hand may be cut in any direction, with speed and accuracy.

By placing a stop at *A*, the perpendicular range of the tool may be readily adjusted.

A number of tools are made at one time. They are clamped side by side in a vise, and milled by one cut of a gang mill. The hardening and tempering of the tools shown was well done, as they were remarkably straight and free from spring or other imperfections.

Freight from Liverpool to London via New York.

Americans are in the habit of looking upon high and discriminating railroad freights as something peculiar to this country. The following from the *Political World* shows that they are not easy over railroad freights in England:

A firm of manufacturers in London have recently been erecting some new machinery in their factory, and among other articles a large iron wheel was required. This a firm in Liverpool undertook to provide, and in due course the wheel was ready for delivery.

It transpired in the course of inquiry that the cheapest way to send this wheel to London would be *via* New York. To send it from Liverpool to London by rail would cost £2, but to send it to New York by ship, and thence back to London, would only necessitate an outlay of £1. It is needless to say that the wheel was sent *via* New York.

The great oil pipe line of the National Transit Company passes beneath both the North and East rivers, at New York, under a great depth of water running with quite a strong current. The East river is by far the deeper, the pipe being sunk from 80 to 105 feet beneath the surface. The line was towed over by tugs and sunk without the aid of divers. One time a leak started between New York and Brooklyn and cheap crude oil poured out in abundance, enough to lubricate the keels of all the navies in the world. Divers were employed from the Merritt Wrecking Company, now at work upon the steamer Oregon, and for weeks they labored unsuccessfully to mend the broken pipe. A clever diver, working in 100 feet of water, finally succeeded in placing a clamp about the ruptured portion, and the line became as good as ever.—*Oil, Paint and Drug Reporter.*

Long bearings, like the interior of sleeves, are hard to lubricate. The oil does not work through the box or sleeve and the bearing gets dry, binds, refuses to run, and we find the concern "stuck." Perhaps a number of hours' work will be necessary to put the bearing in running order, and in one instance when a 200 horse-power friction clutch stuck, a number of days were required to tear down and replace the five-inch shafting which ran through the clutch sleeve. To prevent future disaster of the same kind, three spiral grooves were cut around the shaft in such a manner that the oil worked toward the center of the sleeve. It cured the difficulty effectually.

Sometimes the draftsman wishes to erase a line without removing other parts of the work or damaging a line which cuts the line to be removed. In the above case, lay a sheet of paper upon the line it is desired to save, and with an India rubber eraser the desired line can be removed, and you can work clean and sharp to within $\frac{1}{1000}$ of an inch of the parts desired to be left.

Wheeler's Surface Condenser.

One of the well-known objections to the surface condenser—an objection that has held good since its inception—is the difficulty experienced with the tube packings. Whatever kinds of packings have been tried—and they are numerous—they may all be described as perishable, and at frequent intervals the necessity for complete renovation in this respect exists. The general practice in the use of surface condensers has been to let them alone until such time as the leak and lack of effectiveness from scale deposits became so excessive that a reasonable vacuum could not be maintained, then go through the process of a general overhauling and repacking, a process causing considerable delay, expense and inconvenience. Undoubtedly the trouble and delay sure to come, have prevented the employment of this class of condensing apparatus to anything like the extent that would otherwise have been the case, particularly in the instance of factory and other fixed engines.

Aside from the economy to be gained by reducing the useless work which a steam engine must do, there are many instances when the use of a surface condenser would prolong the life, and render safer the use, of a boiler, in cases where the water obtainable is of such a quality that its continued supply to the boiler results in the precipitation of the foreign matter on the heating surface to such an extent as not only to greatly hinder steam making, but to render the burning of the sheets imminent. With a surface condenser this is avoided because the water is used over and over as in steam heating.

There are other objections to the surface condenser as usually constructed, such as unequal expansion of the tubes, arising from unequal distribution of heat, thus endangering the heads and inducing leaks; also the difficulty of removing the tubes for cleaning, and the trouble in keeping the numerous packings in good order.

The condenser which we illustrate with the line engraving herewith is one made by Frederick M. Wheeler, 93 Liberty street, New York. In the design of this condenser a good deal of study has been given to the overcoming of the objections named. The engraving represents it in its recently improved form, and shows its construction very clearly. The construction is also intended to accomplish such a distribution of the water and steam as to render a given amount of cooling surface unusually effective. By referring to the engraving it will be understood that the exhaust steam from the engine enters at the nozzle *A*. Here it strikes the baffle *O*, which serves the purpose of preventing its direct impingement against the tubes, which might result in cutting through those nearest the inlet in a short time. This baffle plate serves the further purpose of distributing the steam more evenly over the cooling surface. The condensed steam passes to the air-pump through the nozzle *B*.

The circulating or cooling water enters through *C* into the division *F*. From this it passes through the tubes, the construction of which is shown by the cut at the bottom of the engraving. From this it will be seen that the small tubes extend inside the larger ones to near the back end; the large tubes being closed at the back end with caps. The tubes, both large and small, as will be seen, are fitted to their respective heads by screw threads on the enlarged outer ends, while the inner ends being free, expansion or contraction can take place in any degree without in the least disturbing the joints or straining the heads. Both tube heads and tubes are of brass, the latter being turned inside and outside

The large tubes move freely through holes in the supporting plate *P*, which simply serves to steady them at that end.

The water from chamber *F* passes through the small tubes to the back end of large tubes, and returns through the annular surrounding space of the large tubes; when spread out so as to present large surface for its volume it serves its purpose very effectively. From this set of tubes it passes to chamber *H*, traverses the other set of tubes in a similar manner, and finally passes out at *D*.

When necessary to remove the tubes for repairs or cleaning they are simply unscrewed by means of the screwdriver slot in the end, and as readily replaced.

Reference has been made to the efficiency of the cooling surface of these condensers. Recently we were invited to assist in some tests of a small experimental condenser, from which the results shown in the annexed memorandum were obtained. These have been verified by numerous experiments. The condenser referred to had 4.27 feet of condensing surface.

FIRST TEST.

Av. tem. of injection water	56½°
Av. tem. of discharge	98°
Av. tem. of hot well	138°
Av. vac. per gauge	24¼″
Steam condensed per hour per square foot of condensing surface, pounds	101.8

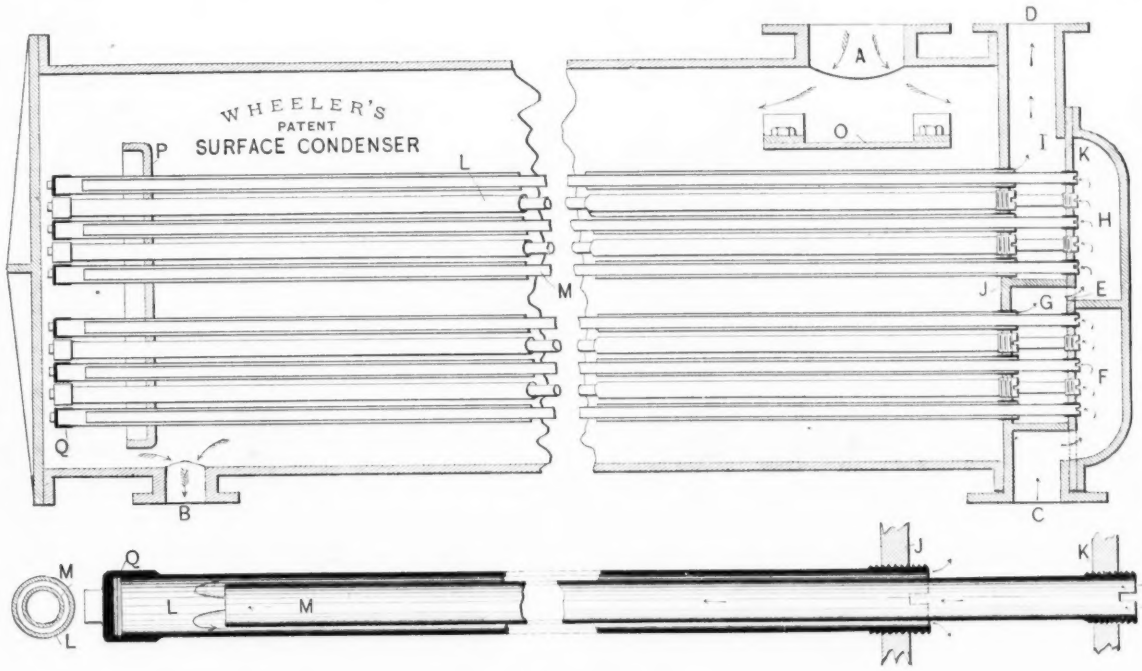
The second test was made with the apparatus working as a simple surface condenser, without vacuum, the results being as follows:

SECOND TEST.

Av. tem. of injection water	78½°
Av. tem. of discharge	139°
Av. tem. of hot well	201°
Steam condensed per hour per square foot of condensing surface, pounds	224.2

In these tests only the surface of the large tubes—that is, the surface actually exposed—was counted as condensing surface, but the results were, we think, remarkable.

The injection water in the second test was heated up to a temperature approaching maximum summer temperature.



WHEELER'S SURFACE CONDENSER.

The work on the New York side of the Second Avenue Elevated Railroad bridge is being pushed rapidly forward, the bridge station at 128th street is being erected, and the prospects of early communication by this route with the suburbs looks exceedingly bright. One point in relation to the bridge, that will bear investigation, is the fact that a path for foot passengers has been constructed on each side, but there are no indications that means of access to it will be furnished, the question in point is, has the law been complied with if the means of reaching the foot path is omitted by the company?

Never use a drill which runs out of true, or "wobbles." Such a tool is incapable of doing good work, and disgraces the man who uses it.

Construction and Operation of Railways.

English engineers are of late paying a good deal of attention to railroad matters in the United States. Recently some notable papers have been presented to the Institution of Civil Engineers. For the following extracts referring to two of these papers we are indebted to *Iron:* Mr. Robert Gordon, M.I.C.E., as representing what had an important influence, made the statement that railroads built on the American plan cost no more than from one-fourth to one-half as much per mile as those built on the English system.

He said, referring to differences in the construction of locomotives:

In American locomotives, the solid bar-frame was retained, generally forged throughout, and it was rigidly connected to the boiler, forming with this a complete truss. Outside cylinders were universal in American practice, with steel fire-boxes, cast-iron wheels, and equalizing bars for all the wheels. In engines with long wheel-base alternate sets of wheels had broad treads without flanges, and were called blanks. Minor differences from English practice, such as the cow-catcher, the spark-arrester on the smoke stack, the enormous lantern, the bell, and the cab for the attendants, with a more ornate general appearance, were to be observed in American locomotives. Of late years in the best English practice, the principle of flexible wheel-base in locomotives had been adopted, so far that the American bogie, or the Adams bogie, or some equivalent like Mr. Webb's radial axle-boxes, were in general use; while on some lines equalizing bars were also used. * * * *

Up to the present time, the 82-lb. steel rail was the heaviest used in America. The cross-ties or sleepers were invariably closer together in American than in English practice. The rails were mostly 30 feet long, and at least sixteen cross-ties of 8 feet to 9 feet in length, 8 inches in width, and 6 to 7 inches in depth, were generally laid to each length on the standard gauge. The flat foot of the rails was from 4 inches to 4½ inches broad, so that with the larger number of sleepers the bearing surface was much greater on the wood than in English practice; and this again had a broader spread on the earth, securing more elasticity to the roadway.

Referring further to the sharp curves and heavy grades of American railways, and the adaptation of American locomotives to these conditions, he concluded that:

It was evident that all saving in first cost of a railway by the retention of features disadvantageous in operation must result in greater expense of working afterwards; and it had been a matter of careful study in America, to determine what equivalents the sacrifice of one or more of the qualities usually thought necessary in a perfect railway required, to justify such expedients being resorted to.

The practice in England is to concentrate, as far as possible, the shops of any line or system of roads, making a gigantic plant of the whole. The following looks as if the author was disposed to favor the American plan in this respect:

The large American railway systems generally found it preferable to distribute a number of shops over the lines to having them concentrated. Every branch of construction of cars and locomotives, as well as repairs, was carried on in them; but it was the practice, as far as possible, to have separate articles made in special factories to standard forms and strengths, which was found at once cheaper and better than each place making everything for itself.

In a paper presented by Mr. James Robert Morse, M.I.C.E., some interesting features of railroading in Canada were given from personal experience. He said:

During a Canadian winter the only way of keeping the rails level was by "shimming up," or packing them with pieces of wood from ½ inch to 3 inches in thickness, and that these packings must be contantly changed, for the rails would vary in level 6 inches in a night; and in cases of extreme frost after rain, they would sometimes rise 12 inches in as many hours. It was consequently a common practice to tap the ice in the side drains with a crow-bar, so that by letting out the water the rails might come to a level.

Altogether, the papers are interesting ones, and show that English engineers are sharply studying railroad construction, operation and management in America, doubtless with a view to getting additional light on the railroad problem in English colonies.

The City of Philadelphia has by recommendation of the Franklin Institute, awarded the Scott medal to Morris L. Orum, for perfecting a machine for routing a cavity, and locks to fit the cavity thus formed.

The English Board of Trade verdict of "Nobody to blame," recently rendered on the Oregon disaster, has at least no claim for originality. It resembles all too closely the average verdict of American investigators in cases of railway disaster and saw mill boiler explosions.

Test the big lathe for a loose fit of the front spindle bearing. The weight of spindle work and face plate often keep the spindle in place, even when there is considerable play in the box. When a heavy cut is taken, the old lathe chatters unmercifully, causing time to be lost and poor work done just at the time good work is required in a hurry.

Statistics of disasters to persons and property are not pleasant to peruse, but they are often valuable as indicating what efforts are needed to prevent their recurrence. The Hartford Boiler Insurance Co. in gathering statistics of the boiler explosions of 1885, finds that 220 persons were killed and 288 injured. The saw-mill boiler is the most prone to do evil, no less than thirty-three of them having gone up during the year, out of a total of 155. Eighteen distillery boilers blew up last year, but they did not do as much damage as the bad whiskey they furnished steam to make. We quote from the summary:

"As was the case the preceding year, but one explosion in a textile manufactory of any kind was reported. Taking into consideration the large number of boilers of this class in the country, two things would seem to be proved thereby: First, that boiler explosions *might* be almost entirely prevented by proper means; and second, that, as a general rule, boilers in this class of manufacturing establishments have most excellent care."

The Boston *Commercial Bulletin* says: "A good many people will be surprised to learn that the biggest building in the United States will be the City Hall of Philadelphia, now in process of construction. Between eleven and twelve millions of dollars have been expended upon it since 1872.

"It is estimated to cover 2,800 more square feet than the Capitol at Washington. The tower on the north side will be surmounted by a statue of Penn, and its extreme height when completed will be 535 feet. It has now reached a height of 270 feet."

LETTERS FROM PRACTICAL MEN.

Lining Up Lathe Spindles—Some Reminiscences.

Editor American Machinist:

I notice a good deal of late in the AMERICAN MACHINIST about lining up the live spindles of lathes. Some have one way, and some another. I don't think a rational man would sacrifice the strength of the housing in which the boxes are fitted—of a good lathe—by cutting a mortice through it and fitting in a taper key, when it can be done so much easier by simply running the tail center up to the live center and note the difference, if any, and slipping a liner, the necessary thickness, under back or front box, as the case may be.

I notice that builders of lathes of the present day are making the front boxes of lathe heads longer, and larger in diameter, which is quite an improvement.

The journals of the live spindle are oftener injured by the carelessness of the man that runs the lathe than by anything else—by keeping the caps screwed down too tight and neglecting oiling. When the journals are once roughed up, the spindle will never fit as it did before, as in smoothing it up again it reduces the diameter; and in smoothing the boxes, they also get larger. True, you can close the boxes down; but you can never make them fit well sideways.

It always gives me pleasure to read the articles of Robert E. Masters. In the AMERICAN MACHINIST of May 1st, he shows an illustration of a small core oven, attached to the top of the foundry stove. It is a good thing. We have had one like it in use for a number of years, but attached to the stove in a different way. Our foundry stove is made from the shell of a small boiler, lined part way up with fire-brick. The sheet-iron box or core oven is cut out at the back, and made to fit the stove like a saddle. Of course, this does very well in winter, when stoves are in use. It can be bolted to a vertical boiler as well, if there is one in use about the shop.

Mr. Masters says that some of the boys may smile at the idea of running a foundry by horse-power. I recollect the first foundry in this place, Indianapolis, being run in that way. The horse-power was of the old-fashioned kind, with an upright wooden shaft, with large bevel wheel above and a small one leading from that into the machine shop. A door opened from the shop into the place where the horse walked round. Of course the speed was very irregular, as every time the horse came around the machinist was ready for him with a stick. Although the horse was blind, he seemed to know when he came near the door, and would consequently try and jump past it; this, of course, made the speed irregular. To cure this he contrived a governor, so to speak, by cutting a mortise in the wooden upright shaft, into which he inserted a long stick that would reach under the horse's belly. To this he fastened a cord that led up through the center of the shaft, then into the machine shop. On the end of the cord was an iron ring that hung down by the lathe.

This was a success, as the machinist could reach the horse at any point of his travel simply by giving the cord a pull.

These were the days when a machinist was a machinist—when engine shafts were made of cast iron, cast eight square; the hub of the fly-wheel cast with hole of a corresponding shape, and the wheel keyed and trued up when on the shaft, with flat wedges. You can rest assured there was very little turning done on the shaft—only the journals and a place for the crank, and not always that, as sometimes the crank was bolted to a flange cast on the shaft.

In those days every screw and nut was made by hand. Then a man had to be handy at anything, and not stick at trifles. Now, as the different shops are working into specialties, it is getting so that a machinist can do only one thing—such as running a lathe or planer. A good chipper and filer is almost out of the question.

BENJ. F. HETHERINGTON.

Indianapolis, Ind.

Chimney Questions Answered—Chimney Requirements for Soft Coal.

Editor American Machinist:

R. M. Bancroft, of No. 9 Ashmount road, Upper Holloway, London, England, asks me the following questions, which please answer through your reading columns as follows:

1st question. Does exhaust steam turned into a chimney damage the bricks, mortar or cement in the interior? In my experience, it will soon damage the mortar by disintegration and weaken the chimney. As to cement, I have not had experience with it in this way.

2d. Does exhaust steam turned into a chimney injure the draft in any way? It will injure the draft by choking it, if not discharged into it near enough the top to accelerate the gases at the top, same as the effect produced by a jet in a steamer's smoke-stack.

3d. When exposed to great heat, will brickwork in mortar or brickwork in cement stand best? The mortar will stand heat the best, and will stand the heat from a boiler furnace in any part of the setting wherein the burning fuel does not come in contact with it. Cement will not stand heat; it breaks off like stone, so it must be mixed with lime mortar to make it stand heat, but it will then stand heat as well as good lime mortar.

4th. Does mortar expand in setting like Portland cement? Lime mortars all expand in setting more or less according to quality, and cements not so much.

5th. Is adding a portion of Portland cement to the lime in making mortar beneficial, or does it injure the adhesive power of lime mortar? It is beneficial only in making the mortar more impervious to moisture, but I think it reduces the adhesion to the bricks or stone.

6th. Have you any chimneys in America built entirely of concrete? Not that I know of.

7th. Some builders say, every three feet height put in two courses of brickwork in Portland cement, the rest being built in mortar only. Is this any use? I don't see any advantage in this; therefore no necessity for it. My way would be to build a chimney with good cement mortar for the outside wall to stand the weather, and the flue of good lime mortar to stand the heat.

Having read Fred. A. Halsey's remarks and references on my article on chimneys in your May 1st issue, I desire to say that the points and references are well understood by me and might have been embodied, but, having specified the ordinary kinds of coal and other fuel, I left the matter of plant and suitable chimney for other and finer fuels to the consulting engineers, who know what is needed in such cases. I suppose Mr. Halsey means by slack coal fine bituminous coal. This name, I believe, is only used in the West amongst the soft coal fields. In the East we have dust, pea and dust, buckwheat, No. 2 nut and nut of the anthracites, and only one name for the bituminous coal, which we call soft coal. We have no difficulty in burning such as we get of it with the ordinary chimneys, and my proportion of chimney has always done better with this coal than any size of the anthracites. It is well known that the finer the coal or other fuel the stronger the draft must be, and the higher the chimney must be to get it.

A chimney with 24″ flue may be carried up 80 feet and with $\frac{3}{8}$ taper it will be $6\frac{1}{2}$ feet at the base, and the base being $\frac{1}{1\frac{1}{2}}$th the height it will stand on a sure foundation. This chimney will be 72 horse-power, according to my rule, with the ordinary coal or other fuels; and with soft coal will easily produce 75 horse-power with satisfactory economy of fuel in fair capacity of boiler, and will do 50 horse-power easily with pea or buckwheat-size coal, and this proportion may be carried out for any other power with these fuels. In cases where the chimney has been found inefficient for buckwheat and No. 2 nut, I have advised mixing them with one part of soft coal to three, four or five parts of the above, with very satisfactory results, because the soft coal prevents the caking of the fine anthracites by its acting upon them as an opener. As Mr. Halsey says, the data available for such calculations are small and insufficient, but to put it all into the requirements of the chimney subject would require a good-sized book.

WILLIAM LOWE.

About Balancing Pulleys.

Editor American Machinist:

As there are many of the "young chaps" who go about this job any and every way, a few suggestions in the right direction might be acceptable. Supposing the pulley is to be put in good "standing balance" only. If no spirit level is at hand, the balancing bars may be roughly tested by laying the mandrel on in the center; and if it rolls with the same apparent ease in either direction we know the bars are about level. After placing the pulley on, hold it still for an instant, and let go; but instead of letting it roll back and forth until it stops, check it a little until you get the oscillations down to about four inches travel of the rim; hold your chalk in readiness and as it rolls toward the right and stops, dash a small mark on the edge of the rim plumb over the center; as it returns to the opposite stopping point mark as before. Make a central mark between these two, and you have the light spot. Now attach the weights and test it by rolling down to a position horizontal to the center, and let go.

If it stands still, roll it to the opposite side, and if it will stand here also, it is correct; but if it rolls *down* the bars are low at this end.

If you are using cast weights, and find that of two sizes, between which there is very little difference, one is too light while the other is too heavy, give the preference to the light one, as it makes the pulley nearer in balance when running.

W. H. CHAPPELL.

Chicago, Ill.

Some Pithy Rules for Miter Gears.

Editor American Machinist:

To find the *addendum angle*, or angle greater than 45° to which the blank should be turned, and the angle less than 45° to which it should be cut, divide $80\frac{1}{2}$ by the number of teeth in the gear.

To find the blank diameter, add $1\frac{4.1.4}{10.6}$ to the number of teeth and divide this sum by the diametral pitch.

To find the diametral pitch, divide the above sum by the blank diameter.

Take for example a miter gear with 23 teeth and 6 diametral pitch. By the first rule $80\frac{1}{2}$ divided by 23 equals $3\frac{1}{2}$° the addendum angle; this addendum angle added to 45° gives $48\frac{1}{2}$°, the angle to turn the blank; and subtracted from 45° is $41\frac{1}{2}$° the angle at which the bottom of the space should be cut. By the second rule 1.414 added to 23 equals 24.414, and this divided by the pitch 6 gives $4\frac{69}{100}$, the size of the blank in inches.

In the above rule I use the same addendum angle for the bottom of the space and the top of the tooth; it should be about one-sixth more for the former if it is desired to have the bottoms of the spaces point to the same vertex as the pitch cone.

If the rule is followed as first stated the clearance will be the same at both the large and the small end of the gear, which I think preferable.

S. W. BALCH.

Labor Employing Capital.

A lecture to workingmen on "The Service which Capital Renders when Employed by Labor" was delivered a few weeks ago in Providence, by Edward Atkinson. The lecture is published entire in the *Evening Bulletin* of that city, and only a press of other matter has prevented us from making some extracts from it sooner. It will be noticed that the subject is happily presented. Labor employs capital just as certainly as capital employs labor. Mr. Atkinson shows by clear reasoning that capital of itself, instead of being a monster ready to crush or absorb everything in its way, is a very essential element of modern civilization. This, however, does not involve the defending of individuals who, having control of capital, use it to oppress instead of to benefit the public, a fact which Mr. Atkinson fully recognizes. He is thoroughly conversant with the economies of cotton manufacture in this country, and gave many examples of the remarkable cheapening of cotton goods to the public by using the best machinery and methods capital could command. We regret we have not space for more extracts from the lecture, but it will be necessary to get it entire to follow the whole course of logical reasoning.

Among other things he said:

Every man or woman who takes any part in the production or distribution of useful things belongs to the laboring or working class, whether the work be of the head or of the hand. I have said I claim to be a hard working man myself, and this bit of work of addressing you, which will take only an hour or a little more, is the result of years of intense work in investigating the facts of life.

I shall assume that certain facts of life are to be accepted. For instance:

1st. That private property exists. That it exists in the nature of mankind, and is older than any written or printed laws which have been enacted by governing bodies, because it is founded in human nature.

2d. That a limited private ownership of land also exists in the nature of things; such ownership being limited by the right of the State to take land or any other private property for public use, with compensation to him who possesses it at the time of such taking, or to tax it.

* * * * *

Now, there is a principle laid down in all the treatises on political economy, to this effect, that the actual property of any large community, like the people of Massachusetts, aside from the land, never exceeds in its market value the market value of the products of the same State for two, or at the utmost, for three years. In respect to food, we are always within less than one year of starvation.

* * * * *

What is there in any of the factories in which you work which has not been greatly changed in the last ten years?

How much machinery is there in any factory in which you work which is twenty-five years old?

What is there in or about the factory which has any market value beyond a single generation of thirty-five years?

There is nothing constant but change in the factory or workshop—nothing fixed.

Which factory does either one of you try to get work in—the old factory in which the owner has been unable to gain sufficient profit from the sale of his goods to keep it up in good condition, or the new factory in which all the machinery is of the very best and most modern kind, and in which the owner possesses so large and ample a capital as to enable him to buy his stock at the lowest price?

In which kind of factory can you earn the highest wages?

In which kind of factory are the goods made at the lowest cost?

Which man can buy his material at the lowest price—the man who has plenty of capital or the man who has plenty of debt which he cannot pay?

Where the best materials are bought at the lowest price, the owner can pay the highest wages for their conversion, can he not? Now, can he make such purchases unless he has sufficient capital?

* * * * *

There are no more laborers in proportion to the work to be done *now* than there were fifty years ago; but the standard of life is a great deal higher. The laborer expects to get a great deal more out of life—as he ought to. And he gets it. Yet he is not satisfied; and he ought not to be. We would not be content with the very narrow and penurious conditions of forty or fifty years ago. The world gets on—gets on by people becoming dissatisfied and trying to do better.

* * * * *

The lower the price, the wider the market; the better the machinery, the higher the wages; the lower the cost and the surer the work.

* * * * *

I do not take the slightest exception to associations of any kind, or to trades unions or to any other organizations or clubs. I belong to a trades union myself—to a trades union of the presidents of all the mutual insurance companies that insure the factories in which you work and keep them from burning up.

* * * * *

When you form your associations like the old guilds, and make the condition of membership that every man shall be master of his own art, as well as master of his own time, then you will benefit yourself and everybody else.

* * * * *

There is nothing like a club of men who are engaged in the same occupation, bringing them together, comparing notes, teaching them to find out the value of their own work and the price at which it ought to be sold.

But they must find it out for themselves and not take the word of another man, who very likely knows nothing about the work, the conditions or the relations of the men to their employer.

* * * * *

We waste about as much as we use, because we do not know any better. One-half the price of life is the price of food. I suppose nearly all the men and women in this room who have families spend half their earnings or more for food. A good way to increase their wages would be to learn what to buy, and how to cook it; to substitute a stew-pan for a frying-pan; to eat sound bread instead of hot biscuit; to learn to like oatmeal or hominy better than pale pie and dyspeptic doughnuts.

* * * * *

I have myself, in my early days, depended upon my daily work for my daily bread, with nothing saved for the future. I have worked fourteen hours a day, twelve hours a day, ten hours a day, eight hours a day—as circumstances and opportunities presented themselves. I have been as lazy as I dared to be. I know how hard it is to begin to save, and how much effort the first thousand dollars of every man's savings costs him—more than any other thousand, except he be so unfortunate as to lose all and have to begin over again. I feel conscious of the truth of a sharp saying of an old Bohemian, that "leisure consists in the diligent and intelligent use of time," and he adds, "If you don't sympathize with the poor, try it."

* * * * *

I may not be able to save you men any part of your day's labor, whether you be eight-hour men, or ten-hour men, or twelve-hour men, but isn't it true that a good many of your wives are *fourteen-hour women*, don't they work long and arduously for you? Where is the housewifes' trades union? Who goes for eight hours labor for the true head of the household?

"Our guardian angels, o'er our lives presiding,
Doubling our pleasures and our cares dividing."

Honestly now, do they divide even with us—who works longest now, you or your wife?

* * * * *

At the close of the lecture several questions were asked in response to Mr. Atkinson's invitation. One of them was:

"Do you consider Jay Gould a blessing to the community?"

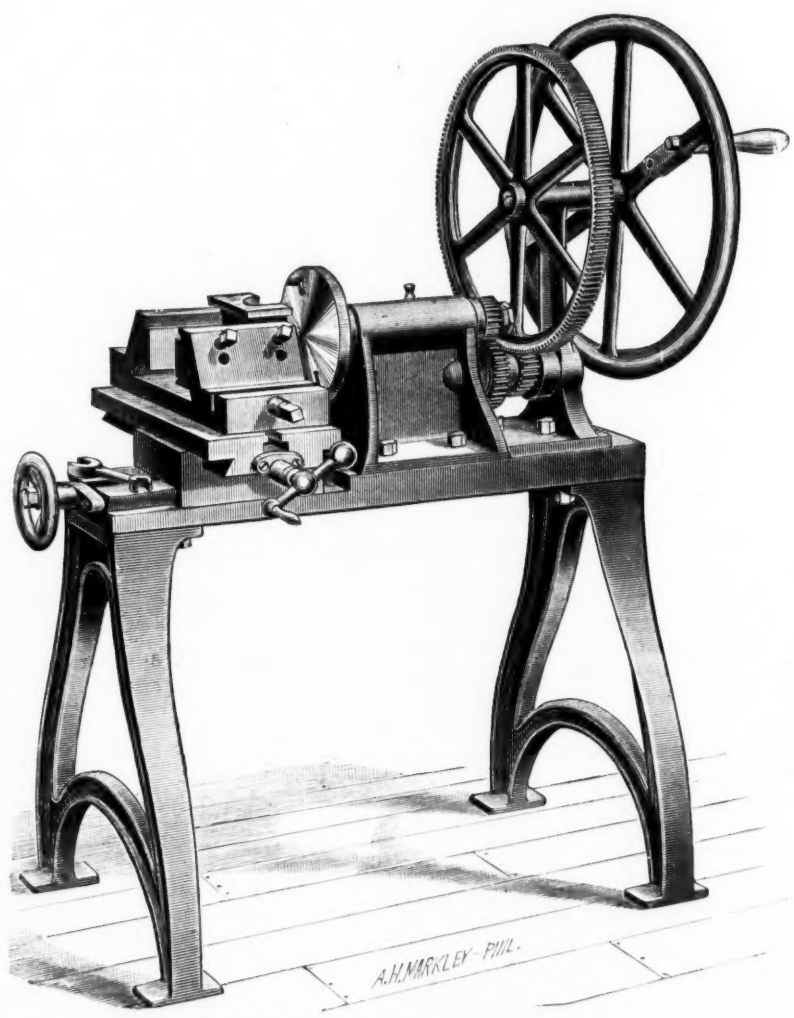
Mr. Atkinson said he would answer this by asking the question if he considered an unconvicted felon a blessing to the community? [Applause.]

Machine for Facing Locomotive Brasses.

The machine illustrated with this is designed for facing connecting and parallel rod brasses. As arranged for hand work two men can carry the machine wherever required for use. The brasses are placed in an adjustable chuck, which holding them as they are held in the strap, presents the face to the cutter in such a way that when faced off the surface will be true. When this must be done with a file a good deal of time is consumed in getting the faces exactly true, which is essential for all boxes keyed brass to brass.

A single cutter is used, placed in a disk adjustable for different diameters; this cutter can be quickly removed, ground and replaced. The carriage upon which is the chuck is brought up to the cutter; any desired cut up to one-eighth inch can be taken.

The manufacturers are Pedrick & Ayer, Philadelphia, Pa.



MACHINE FOR FACING LOCOMOTIVE BRASSES.

It is said that a Japanese mechanic can measure distances with his eye. He can reduce wood and iron to squares and levels in that way. He will cut a board or a stick a given number of feet, using his eye for determining the length and breadth. Every Japanese boy who is fairly well educated draws with just about as much facility as he writes. He figures everything which he wants to illustrate. Having occasion once to ask a Japanese student something about methods of warfare in that country (he had been a soldier attached to one of the great Damios), he immediately figured his explanation in a neat drawing on paper. He could not command enough English words to make his meaning clear, but he could make it clear by a sketch with his pencil. Not one American boy in ten who has received a fair common school education could have made a free-hand drawing illustrating the use of war implements or implements of industry—*San Francisco Bulletin.*

Railroad Shop Notes.

The repair shops of the Delaware, Lackawanna and Western Railway at Kingsland, N. J., are in charge of Master Mechanic W. H. Lewis.

An average of 140 engines are kept in repair with a working force of 186 men, including considerable new work and the overhauling of eight locomotives per month.

At present they are building a 19″x24″ mogul, doing all work upon the premises, from forging frame and springs to making the injectors.

The boilers are all tested under hot pressure. They are first warmed up by steam from the shop boilers, then the pressure is allowed to run up to 30 lbs., when the steam is shut off, injector started and allowed to force water into the boiler as long as it will work.

When the injector stops working, the boiler is nearly full of water. A pump is attached and the pressure pumped up to the desired amount, giving a hot pressure for testing, which is very effective in revealing all broken stay bolts, which cannot be detected, even by the hammer, when the boiler is cold and not under pressure.

Air pumps are tested in the shop, by steam from shop boilers. The air pumps are connected with a tank, which bears a gauge. The air is pumped up as in actual use, when any defect can be easily detected.

Phospher bronze rings are used for packing in the air pump valves. It gives better satisfaction than cast iron.

The metric system of measure is used in all air pump work, and is much liked by Mr. Lewis.

On engines for express passenger trains, a bushing 8 *mm.* in diameter is placed in the feed injector, while for freight engines, a 7 *mm.* bushing gives water enough. The switch engines have but a 6 *mm.* bushing in their injectors.

A patent brake shoe for engine drivers, is cored out so that it does not bear on the tire where the wear from rail is received. This shoe bears upon the flange, and upon a surface about two inches wide on tread outside the rail.

Paper wheels are used under all tenders. For forcing on and off wheels, Mr. Lewis has designed and built a hydrostatic machine, which is peculiarly adapted to the purpose. The ordinary press, as used in many shops, has been found not strong enough for locomotive wheels, and great trouble was caused by frequent breakage of cylinders.

The new press, as constructed by Mr. Lewis, is very strong, and is fitted with a simple lifting arrangement for raising the axle and wheels from floor into line with the ram.

The lifter is worked by the same pump which works the ram. Owing to the speed of the ram (12 inches per minute) and a quick return, a greater amount of work can be done with this press than is possible with the ordinary car-wheel press.

Several boilers are made wide enough to set over the frames, securing 6 or 7 inches more width of fire-box by so doing.

In obtaining boilers for this purpose, Mr. Lewis has been forced to make his own. Owing to the difficulty of caulking or repairing leaks in bottom of water legs when they come over frame, the boilers require nice fitting at the laps, or they are sure to leak. In boilers bought outside, a wedge or "Dutchman" is rivetted into the lap, and invariably causes trouble by blowing out.

Old boilers are cut up by outside parties under contract. By so doing quite a saving is made, as the price per ton for the old iron is much more than could be obtained for whole boilers.

One of Rusforth's feed-water heaters has been in use for over a year, and is well spoken of by Mr. Lewis, who claims a saving of 30 to 35 per cent. in coal, and increased circulation in the boiler.

This heater is placed in the smoke-box just in front of end of the tubes. It consists of a series of steel pipes, which are connected with top and bottom of water space in boiler. At present ten heaters have been placed on as many locomotives, and they all give good results.

The valve seats are not scraped in this shop. A milling device is used, which is said to give a true surface.

In boring cylinders the fine finishing cut has no place here. We were shown a number of cylinders where the tool marks showed a feed of three cuts per inch, and one cylinder, 19″×24″, was shown, which received its finishing cut in 35 minutes.

In moving engines from shop to round-house, they are never fired up. Steam is taken from the shop boilers, and with a pressure of 80 pounds per gauge at start, the engines are able to run into round-house without the trouble or smoke of firing up.

The repair shops of the New York, Lake Erie and Western Railroad, between Jersey City and Hoboken, N. J., at present give employment to about 300 iron workers, and keep in repair between 175 and 200 locomotives.

No new work is done at these shops, except replacing worn-out material, new engines being built at the Susquehanna, Pa., shops.

J. H. Vreeland is master mechanic of this division of the road, and also has charge of the car shops, which are situated about a mile inland from the locomotive repair shops.

In 1872 fire destroyed the repair shops of the company at this place. They were rebuilt in a less extensive manner, and owing to financial reasons they have not since received the attention to which they are entitled. The erecting, boiler, smiths' and other shops are connected by a long transfer table, which is operated by a retired locomotive, kept for that purpose alone.

In the smiths' shop at present sixteen forges are in operation. This shop is well ventilated, and is kept very free from smoke by large ventilators, built cupola style, above the apex of the pitch roof. A steam hammer, several trip hammers, shears, punches and a machine for cutting off round iron comprise the machinery in this shop.

The machine tools in these repair shops, although not of recent design, are capable of doing a large amount of good work, and are crowded to nearly their full capacity.

The workmen, like the tools, have been with the company ten, fifteen and even twenty years, proving that when a good man came to the shop he came there to stay.

A few of the engines in use by this road are fitted with extended smoke-boxes and straight stacks. They are, however, not being generally applied.

Both anthracite and bituminous coal are used upon this road; and fire-boxes are arranged differently to burn the two kinds of fuel.

Public, not Private, Water Works for Cities.

We have always taken the ground that cities should own and control the water works and gas works that supply their inhabitants. The opposite policy, that of depending upon private companies to supply water and gas, always will be a source of trouble wherever it is followed. Syracuse is a large city, but it has no public water works. The question of bonding the city to build water works was decided adversely at an election last week. In the *Evening Herald* of that city, before the election, we noticed an "appeal to wage workers," by the well-known engineer, Wm. A. Sweet, who mentions the general conduct of the water company thus:

"They lay new pipes only when they are obliged to. There never was a corporation so badly managed in this city. The company has no head, and for years has not had one who could be approached to do any business with. This company has always been overbearing and arbitrary. It has never, either in spirit or word, done anything for the citizens without being dogged into it or paid for it. It has not fulfilled its charter in letter or spirit. It has not furnished either the quality that is guaranteed by their charter or the quantity as the charter says it shall."

About the same remarks could truthfully be applied to many other private companies that are depended upon to supply water to the people of cities and large villages. This company has made the manufacturing interests of Syracuse, and the houses of its citizens, dependent upon rotten sheet iron pipe, which is dangerous when the possibility of large fires is considered. Mr. Sweet's establishment has started to put its own pumps to raise water from six six-inch wells joined together with pipe so as to have a good water supply and a service equal to four steam fire engines. The opposition to the plan of bonding Syracuse for water works was probably founded on objections to the details of the scheme. Every city should own its water works.

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NEW YORK, MAY 15, 1886.

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Mistaken Opposition to Machinery.

Occasionally we hear of instances where workmen strenuously oppose the introduction of more labor-saving machinery on the ground of reducing wages, throwing men out of employment, and injuring the condition of workmen generally. Great as the spread of knowledge is in this country, when we hear of such instances we are forced to conclude that there is considerable ignorance yet to dispel. One of the plainest truths in industrial operations is that competition reduces prices of articles, and that he who can produce an article of a certain quality the cheapest has the greatest advantage in selling. Cheapening production is reached either by improving machinery and appliances for doing the work or by lessening wages. It follows that the establishment having the most efficient labor-saving machinery is enabled to pay the highest rate of wages. Those manufacturers who reject labor-saving machines find it necessary to reduce wages in order to compete with their rivals who use such machinery. Taking a more general view, we find the same fact revealed in a stronger light, viz., that where the most labor-saving machinery is used wages are highest. America is the highest-priced country for labor, and we use machinery to an extent unsurpassed by any other country. Great Britain employs the most labor-saving machinery of any European nation, and, in spite of the hampering of free trade, the British workman is the best paid in Europe. We might go down the scale of countries that use less and less machinery until we reach China, where the least is used, and where the workmen receive the most miserable pittance on earth. They are virtually in slavery, and are the only workers excluded by law from coming to this country. There is no exception to the rule that the more labor-saving machinery is used the better labor gets paid.

The increasing use of machinery also tends to shorten the hours of labor. No workman who expects to see a shorter time established as the limits of a day's labor should oppose labor-saving machinery.

Our export trade of manufactured goods is becoming quite extensive, and bids fair to increase indefinitely. The use of original improved machinery is what enables this trade to be carried on. Competition against cheap foreign labor would be impossible without the superior advantages of labor-saving machinery. Progress in cheapening the cost of manufacturing by machinery will enlarge our exports, and give employment to more workmen to supply the demand from new markets. The farther we can keep ahead of the Old World in mechanical appliances, the surer will be the opportunity of the masses of workmen to be fully employed.

Labor-saving machinery has lifted the workman from drudgery into conditions of toil that protect his physical powers. Operations that formerly required the expenditure of strong muscle are now carried on with ease by means of machinery. Instead of wearing out his physical strength, the workman now directs the forces of nature, and transfers the heaviest wear to mechanism that produces many fold greater results than he was able to do without that powerful agency.

We need not be reminded that toil is still arduous, but there are hundreds of improvements yet to be made by which it may still further be lightened Machinery must be called upon in the future to do much of the work now done by hand.

The general condition of the workman has always been improved by the increasing use of labor-saving machinery. Thousands of comforts and conveniences of life he now enjoys that he never could procure in the earlier days when but little machinery was used. The more extended the employment of labor-saving machinery, the better will be the condition of working men.

The misuse of tools in some shops is a source of expense which is not always realized. A dog is screwed on a shipper-handle, gets left there and forgotten. A workman spends half an hour in hunting up that dog.

The misuse of tools may be carried to the opposite extreme; a workman who receives a reprimand for laying down a tool, for the time being, where it does not belong, soon gets a poor opinion of the foreman, and cares very little for the economy of the shop.

Reducing Wages on Public Works.

Wages are higher in the United States than in any other nation in the world, as they ought to be. When workmen are generally employed at good wages business is everywhere prosperous. When wages are extraordinarily low business as a whole languishes. It is therefore for the public good to keep wages from being cut down unnecessarily. Competition among industrial establishments is not chargeable with the worst cutting of wages. The officials of state and county government and municipal corporations are responsible for the most grievous reductions. Where public work is let out by contract the lowest responsible bidder gets the job. The specifications of these contracts are usually very closely drawn as to materials and kind of work required, but nothing is specified to protect the labor to be employed on the work. The contractor who can beat labor down to the lowest point generally gets the job. Probably he takes the contract at a price which would yield no profit if fair wages are paid. His profit is therefore gouged out of the workmen's real earnings, and the lower rates of wages thereby instituted are made to apply to other workmen engaged by other employers to the injury of the whole community. It is time a reform was started in this field. The evil is one that can readily be cured. Either the work should be done directly for the government or the contracts should name the lowest rate to be paid for labor. This would cost something more than the present squeezing down plan, but better work would probably be secured, and as employers would not be competing with each other in products, no trade would be injured. The people can better afford to pay fair wages on public works than to use the strong power of government in working injury to labor.

A reform of this kind was recently made—very promptly too—in the live go-ahead city of Minneapolis. The people of that city determined to have a big industrial exhibition building for annual displays. The first contract let was for tearing down an old hotel upon the site selected. The shrewd individual who got the job sent to the relief association and engaged a full complement of men at 80 cents a day to do the work. It did not take the citizens long to decide that able bodied labor at 80 cents a day was not one of the features of their prosperous city that they would take pride in showing to visitors from afar who should come to the exposition. The next contract awarded was for excavating for the foundations and it contained a clause binding the contractor to employ nobody at less than $1.25 a day. There is always a large amount of public work to be done by contract in this country, requiring both skilled and unskilled labor, and the officials who have the awarding of the contracts should be given to understand that the interests of the whole people require that labor to be fairly paid.

Legalized Evasion of the Tariff Law.

Growing out of the existing labor troubles in the bituminous coal mines of this country, a temporary expedient has lately been resorted to by the bituminous coal companies which deserves attention. The lines of transatlantic steamers running out of New York are owned by English and other companies and are mainly officered and manned by foreigners. These steamers use large quantities of bituminous coal on their return voyages, which they have been in the habit of getting from American bituminous coal companies on yearly contract.

Owing to labor troubles the coal companies have lately been unable to furnish coal from their own mines, and have resorted to the importation of English bituminous coal as a means of keeping their contracts with the trans-atlantic steamship companies. While this practice may be a convenient one for the American coal companies, as they are just now situated, it is liable in the future to result somewhat disastrously to the interests of American producers, both employers and employed.

It seems that these importations of English coal are made in accordance with the provision of our tariff law, which permits the free importation in bond of foreign merchandise which is to be afterward exported. Under this law, the Englisb bituminous coal is brought to the port of New York in "tramp" steamers, and can doubtless be brought over in sailing vessels quite as readily, often even as ballast. It is then either dumped down on the docks of the outgoing foreign steamers, where it lies "in bond" until transferred to their holds, or it is loaded upon canal barges and thence transferred to the bunkers of the steamship requiring it, *duty free.*

There are one or two queries which seem pertinent right here.

How much protection does the existing duty on bituminous coal afford American miners, if the provisions of the tariff law can be legally evaded in this fashion?

Why should foreign steamships be regarded as "exporting" coal, which they buy, not for the purpose of carrying it to Europe, but for the purpose of burning on the way, and more especially as we are informed that the American-owned steamships engaged in coastwise trade mostly burn the higher-priced anthracite?

When the existing contracts between the American bituminous coal companies and the trans-atlantic steamship companies expire, what is to hinder any enterprising European or Canadian from preventing their renewal, and engaging to permanently supply the steamship lines with English or Nova Scotia coal?

The steamship owners and officers being all foreigners, would not they naturally prefer to buy coal of their own countrymen, if a a way appears enabling them to do so at rates equally favorable?

If American law makers want to favor steamship lines running to foreign ports, why not reserve such privileges for lines that are distinctively American?

How to Secure Good Workmen.

It is a matter we have frequently heard discussed lately, whether manufacturers requiring a good deal of skilled help had not made a great mistake during the past ten years in not taking more apprentices. The head of one large manufacturing establishment in which the custom for years has been to keep a fair number of apprentices, expresses the belief that to this is due the fact that they are able to keep themselves provided with skilled workmen of exactly the kind they want. He says that boys after learning trades in their shops are very likely to gratify their desire to see a little of the world, but the majority of them find their way back after a short absence, and remain with them permanently as journeymen.

Literary Notes.

THE MODERNIZED TEMPLETON. THE PRACTICAL Mechanic's Workshop Companion. Comprising a great variety of the most useful rules and formulæ in mechanical science, with numerous tables of practical data and calculated results for facilitating mechanical operations. By William Templeton. An entirely new edition, revised, modernized, and considerably enlarged, by Walter S. Hutton, C. E. D. Van Nostrand, 23 Murray and 27 Warren streets, New York.

This work, in its original form, has been for years one of the well-known pocket-books used by mechanics and mechanical engineers. In this edition much new matter has been added, and some old matter that had become obsolete is omitted. In its new form, the work is one that we can confidently recommend as containing a large amount of information, very conveniently arranged.

We have received a closely printed pamphlet of 20 pages, entitled "A Bill to Promote Mendicancy—Facts and Figures Showing that the South does not Need Federal Aid for her Schools." Whatever the bill may be

it is not published in the pamphlet, which is only "a reprint of editorial articles published in the New York *Evening Post* during January, February and March 1886." The *Post* opposes the bill. Right here we take occasion to say that the average American citizen does not care a rap for [illegible]d torial opinions of any newspaper. What he wants are facts of current interest, and he expects to find them in the [illegible] of a paper. From th[illegible] he forms his ow[illegible] citizen is just [illegible]rect in his conclusions [illegible] as the editor of an afternoon [illegible]ditorial opinions ar[illegible]read ver[illegible]tories are—as a sort of pastime.

USEFUL THINGS TO KNOW ABOUT STEAM Boilers. Compiled for the information of owners, steam users, and engineers. By G. B. N. Tower. Published by the American Steam Boiler Insurance Co., N. Y.

In this work a good deal of useful information for steam users and engineers is given in a clear, practical manner. Illustrated descriptions of various forms of boilers appear, with argument as to their efficiency and use.

The subject of combustion occupies considerable space. This subject is an important one, and anything throwing additional light upon it will be well received. Among the subjects treated we notice incrustation, corrosion, explosions, boiler management, safety valves, boiler fittings, etc. These are all matters upon which information is always valuable. A lengthy appendix contains tables of value in connection with steam engineering, and other mechanical matters. Under the head of "Miscellaneous Items" various recipes and tables of value are furnished. The whole is comprised in a well printed and bound book of more than 200 pages.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(202) J., Philadelphia, Pa., asks: What is the best way to bore taper holes in lathe spindles and drill sockets to have them run true? *A.*—The more modern practice is to grind such holes true with a small wheel, the spindle revolving on its journals. Formerly it was the practice to bore and ream the holes, then to throw the back center in the piece to one side to make the hole run true, and turn the piece, trying it after each cut over it, and moving the back center, if necessary. An accurately turned plug fitting the taper hole, and extending some distance, will indicate the direction in which the back center should be moved.

(203) Ontario, Cincinnati, Ohio, asks: Will an engine 3"x4½", mean effective pressure 40 lbs., give more power and better results at 300 than at 200 revolutions? *A.*—If the engine is properly constructed, it should give better results at 300 revolutions, and do more work, about in proportion to the increase in speed.

(204) H. D., St. Louis, Mo., asks: 1. How can I tell by the way the pet cock acts when the pump is not working properly, and where to locate the trouble, the pump used being a single-plunger force pump? *A.*—If the pump is working properly a stream of water will be forced from the pet cock during each down stroke of the plunger. During the return stroke, if the water does not enter the pump with much pressure, the tendency will be to draw air into the pump through the pet cock. 2. The suction valve being caught up, how will the water flow out of this pet cock? *A.*—Water may be forced from the pet cock if the draft is light, but the water forced out will not have so great velocity. In case of considerable draft, the pump will simply "churn" air, and no water will be expelled at the pet cock. 3. How can I tell whether the check valve is working properly or not without examining it, or by testing the pet cock? *A.*—Listen for the sound of the check valve, and judge accordingly. 4. How can I tell whether the discharge valve is all right without examining it (by trying the pet cock)? *A.*—If this valve is in perfect order, the pet cock will fill conditions named in answer No. 1; if the valve be caught up, and there is no other check-valve between pump and boiler, hot water will, after a short time, make its way into the pump, and be expelled during both up and down strokes of the plunger. 5. Would not a pump work without the check valve near the boiler, and why is it necessary when there is a discharge valve? *A.*—It would work thus, and is not necessary to the working of the pump. Still, a check valve should always be placed in feed pipe, close as possible to the boiler, for many reasons, especially for the purpose of keeping hot water from making its way from boiler to pump, and acting as described above. Sometimes, if valves of pumps leak slightly, water from boiler will heat the pump so [illegible]t that it will refuse to deliver water until the [illegible]p has been cooled. Other reasons in favor of a check valve are its value if pump becomes disabled, as it can readily be removed or repaired if a good check valve is in the pipe near the boiler.

(205) C. W. W., Wahoo, Neb., asks: 1. How is the japan made which is used on sewing machines? *A.*—A good japan can be made by dissolving 2 oz. asphaltum in a little oil, add 4 oz. burnt umber ground in oil, then add sufficient oil to make the entire quantity of oil used equal two quarts. Thin with turpentine. 2. How long should the articles be baked, and what degree of heat should be used? *A.*—Bake until the varnish is dry. The degree of heat should not cause the varnish to run, probably from 212° to 300° will answer. 3. Could the work be done in an ordinary cook stove, or an oil stove oven? *A.*—Yes. 4. Is kerosene oil beneficial as a preventative of scale in steam boilers, or is it injurious in any way? *A.*—Crude petroleum is, in some instances, used with good results. Its success will depend, to a great extent, upon the character of the feed water. You can purify the water by precipitating the matter held in solution in a good heater. If it is not convenient to do so, much benefit may be derived from the intelligent use of surface blow-off, and by the use of boiler compounds, based upon a careful analysis of the water used in your boilers.

(206) J. L. D., North Adams, Mass., writes: How can I find the angle for cutting a worm gear when the pitch of worm is known? *A.*—On page 1 of the AMERICAN MACHINIST, February 7, 1880, will be found an article upon the subject, which will give the desired information. 2. What is the weight of each car on the Brooklyn Bridge, unloaded and loaded? *A.*—The Dure Car Manufacturing Co., of Wilmington, Del., say: "The weight of the bridge cars (long cars), is from 28,000 to 30,000 pounds each; seating capacity, 46 passengers." We may add that all the standing room is frequently occupied, the total number of passengers being, probably, 100. You can estimate for yourself their weight when loaded, 3. Would an automatic arrangement for raising cable, to be connected with grip, be of any value on the bridge? *A.*—Doubtless an efficient cable raiser would be of value.

(207) Ignoramus, Philadelphia, Pa., writes: I have trouble in case-hardening small shafts 8" long and ⅜" diameter. The shafts warp in case-hardening, and the hardened surface is not as deep as I would like. The hardening is also unequal, some parts being hard and others quite soft. I place a number of the shafts in a cast iron box, covering them well with bone dust, then keep the box at a red heat for two hours, and finally dump the contents into water. Can you suggest the trouble? *A.*—Iron will not case-harden evenly unless it is quite homogeneous. You should not try to case-harden anything unless made from iron of the best quality. Even the very best quality of iron will spring to some extent in case-hardening; poorer or uneven quality will spring more. If the case-hardening is not deep enough, the presumption is that the heating has not been long enough continued. From your description of your process, we infer that you do not pack your pieces properly. You should pack each piece so that no two touch one another.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Alt, Mechanical Engraver on Wood, 318 B'way., NY

T. M. Parker, Steel Stamps, Stencils, Hartford, Ct.

J. Clayton, Air Compressors, Rock Drills, 43 Dey st, NY

Edw. Sears, Wood Engraver, 48 Beekman st., N. Y.

Steel Name Stamps, etc. J. B. Roney, Lynn, Mass.

Tack, Wire and Shoe Nail Machinery. Wm. A. Sweetser, Brockton, Mass.

Selden Packing, for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., NY

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

Light articles built to order by the American Sewing Machine Co., Philadelphia, Pa.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

Foot-power Machinery, for workshop use, sent on trial if desired. W. F. & Jno. Barnes, Rockford, Ill.

Improved Labor-saving Upright Drills, 20-in. to 36-in., inclusive. Currier & Snyder, Worcester, Mass.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 93 John st., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocum & Son's Shafting Works, Drinker st., Philaddelphia, Pa.

"Morrison's Practical Engineer." A complete treatise (200 pp.) on steam and general mach. Mailed on receipt of $1. W. A. Morrison, Box 373, Lowell, Mass

Engine Lathes, Hand Lathes, and other fine tools, Assortment large; prices low. Frasse & Co., 62 Chatham st., N. Y.

E. Merritt & Co., Brockton, Mass., established 1859, only manufacturers of a complete line of Tack and Nail Machinery. Send for circulars.

Files recut without drawing temper, about one-half usual prices; samples recut free; prices on application. The Acme Co., Collinsville, Conn.

Curtis Pressure Regulators, Curtis Return Trap Curtis Damper Regulator. See May 1, p. 10. Send for circular No. 17. Curtis Reg. Co., Boston, Mass.

"Complete Practical Machinist," $2.50; "Mechanical Drawing Self-taught," $4. Books for workmen. Joshua Rose, Box 3306, New York City.

Bound Volumes of the AMERICAN MACHINIST for the years 1880, 1881, 1882, 1883, 1884 and 1885. These volumes are strongly bound in cloth, and will wear well. Price $3.50 each; express charges additional. AM. MACHINIST PUB'G CO., 96 Fulton st., N. Y.

St. John Improved Self-adjusting Cylinder Packing, for marine and stationary engines and locomotives; applicable to water, air, oil and ammonia pumps. For durability and minimum of friction, it is unexcelled. Send for pamphlet. Address, Balance Valve and Piston Packing Co., room 58, 280 Broadway, New York.

Patent Binders for the AMERICAN MACHINIST, holding a complete volume (52 issues), simple, neat, durable. Price $1, prepaid, to any part of the United States by mail. To Canada or foreign countries the price will be 75c.; purchasers pay express charges and customs duties. AM. MACHINIST PUB'G CO., 96 Fulton st., N. Y.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator, and making all required calculations from the diagram; also the principles of economy in operating steam engines, and current practice in testing engines and boilers. Price, $2, post-paid. For sale by John Wiley & Sons, 15 Astor Place, New York.

MANUFACTURES.

The Wood Manufacturing Company, of Camden, N. J., will erect a worsted factory, 53x150.

J. S. Dowry will rebuild his machine shop at Winchester, Ky., reported as burned; loss, $3,000.

Pillsbury & Co., Minneapolis, made a single sale of flour on export account of 44,000 barrels.

W. H. Adams, of Corinth, Miss., proposes to add a two-story machine shop to his iron works.

The foundry of the Michigan Iron Works, at Cadillac, Mich., will shortly be in operation.

E. G. Blakeslee will soon erect a stove foundry at Sing Sing, N. Y.

The P. R. R. Co., will erect a machine shop at the Chelten ave. depot, Germantown, Pa.

The National Tube Works will be removed from Boston to Ohio. So says the *Manufacturers' Gazette.*

The Cresson and Coalport Railroad Company is building a round-house and shop at Cresson, Pa.

A large air compressor is being built by the Clayton Steam Pump Works, Brooklyn, N. Y., to go to New Orleans.

The Atlantic Steam Engine Co., Brooklyn, N. Y., are building six 5x17 foot boilers and a lot of ice machinery to go to New Orleans.

A brick foundry, 140x60 feet, is to be erected by Johnston & Holt, at Delaware avenue and Elm st., Camden, N. J.

A Boston roller-skate manufacturer is reported to have contracted for 30,000 pairs to be made in the State prison.

The new rolling mill in Columbia, Pa., is under roof, and the machinery is being placed in position.

Mr. R. Smith has just commenced a foundry at Pontiac, Ill., in the building formerly occupied by S. C. Pillsbury.

It is reported that John Crystal & Co. will build a new machine shop on Temple Hill, Geneseo, N. Y.

It is stated that Pittsburgh parties have secured the lease of the secret process for making mitis castings, and will erect works in a short time.

Wm. E. Holt and Charles A. Hunt will build a two-story cotton factory, 50x200 feet, at Lexington, N. C. The contract for the brick work has been let to Watson & Cecil.

Crawfordsville, Ind., is making a bid for the location of the Louisville, New Albany & Chicago machine shops, and the citizens have voted a 2 per cent. tax to raise money to secure them.

A foundry is to be established at Vinton, Iowa, by N. W. Russell, of Cedar Falls. The erection of a building has been begun, and it is expected to have the foundry in running order within a month.

The Long & Allstatter Co., of Hamilton, Ohio, recently shipped a shear to the Gautier Steel Company, of Johnstown, designed to cut off three-inch square cold tool steel.

The Watts-Campbell Co., of Newark, N. J., have taken orders during the past week for nine large engines. That was the best week for orders they ever had.

The Pond Engineering Co., St. Louis, have been awarded the contract for the pumping machinery of the Mount Vernon, Ind., water-works. It will have a capacity of 2,000,000 gallons in 24 hours.

H. L. Fearing & Co., who had employed convict labor making chains, has leased the old Tube Works property, East Boston, Mass., and will immediately start work.

The Pratt & Cady Company, Hartford, Conn., patent cocks, is adding a new wing to its factory, 60x44 feet, two stories high, also an extension to its foundry, 40x44 feet.

B. L. Solomon's Sons have bought ground at Wayne Junction, Pa., and will erect thereon a large mill for the manufacture of upholstery and drapery goods and curtains.—*American Cabinet Maker.*

The first Bessemer steel converter in the South was recently made at the South Tredegar Iron Works, at Chattanooga. Good steel was produced. Capacity is 80 tons a day.

The Putnam Machine Co., of Fitchburg, Mass., is about to put an addition, 150x80 feet, on its foundry. It will take about two months to complete it, when about 100 more men will be employed.

The people of Plymouth, Me., are jubilant over the prospect of having a woolen mill erected in the village. A $10,000 mill is proposed, and it is announced that $7,500 of this amount has already been subscribed.

The Chicago *Industrial World* says: "Under the firm name of Dicke, Meyer & Pilfusek, a new enterprise has been started at 66 West Lake street for the manufacture of fine cutlery, tools, taps, dies, etc.

McConway & Torley, manufacturers of malleable iron and proprietors of the Janney coupler for passenger cars, have purchased land in Pittsburgh, Pa., on which they will erect new and extensive works.

Three corporations, who desire respectively to put up a glass factory, a tannery and tube works, are negotiating for land at Oakdale, Pa. It is also stated that negotiations for land for steel works are in progress.

H. W. Hutchins, the scale-board box manufacturer, of Lewiston, Me., is to build a new factory in Auburn, on the lot south of Parsons Bros.' flour mill, according to the Lewiston *Journal.* The proposed building will be 50x100, four stories.

The citizens of Gloucester City, N. J., have started movement to induce the settlement of new manufactures there. A number of property owners will donate sites. An organization to push the movement has been effected. Henry Black is president.

The great iron firm of Jones & Laughlin, Pittsburgh, Pa., are preparing to make additions to their already very extensive plant. They contemplate erecting three new trains, 10, 12, and 16-inch, on which to work their steel.—*National Labor Tribune.*

It is said that George S. Scott, of the Richmond & Danville Company, Richmond, Va., and a syndicate of New York capitalits have made investments amounting to $500,000 at Asheville and Warm Springs, North Carolina, upon which they will lay out a town. Large railroad shops and car building works will be erected there.

The Ames Manufacturing Company, of Chicopee, Mass., have received a $6,000 contract from the Winchester Repeating Arms Company, of New Haven, for the manufacture of 25 machines, and have set 30 men on the new job, which will be finished in about three months. This is thought to insure steady work at the shops, which have been shut since February 13.—*Boston Commercial Bulletin.*

The Lidgerwood Mfg. Co., 96 Liberty street, N. Y., and 159 Friend street, Boston, have issued a very tasteful and well-arranged catalogue of improved hoisting engines and boilers made by them. Over 3,000 of these hoisting engines are in use, with improved friction drums. The engines are built with a complete system of gauges and templets, insuring exact duplication of parts. A wide variety of hoisting engines are shown by engravings.

The Purdy Machine Co., of Cleveland, Ohio, report business up to that of a year ago, but that there is room for improvement; the labor troubles have caused the cancellation of several orders till matters quiet down. This company have in the mill a special wood turning lathe, and are now shipping orders to several large railroad machine and repair shops throughout the country, having one 10-foot 30x30 planer going to the Pacific Coast. *Railway Review.*

Robert Deeley & Co., foot of West Thirty-second street, New York, have issued a finely printed and profusely illustrated catalogue of machinery for sugar plantations and refineries. This establishment has been in business about a quarter of a century, and has supplied machinery to the principal refineries of North America, and hundreds of the largest plantations throughout the world. In 1883 they supplied the complete machinery for a refinery at Cardenas, Cuba, the first ever built on that island. It is working satisfactorily, and producing 100,000 lbs. of refined sugar per day.

A new and improved style of car wheels have made their appearance, combining the qualities of safety and low price. They are made at the works of Freid Krupp, Essen, Germany. The tire is forged steel, with a wrought iron coil disk center; the two parts being welded together form a perfect indestructible wheel in one piece. About 60,000 are now in use in Europe. The first of them seen in America were imported recently for the Boston & Providence Railroad Company, whose second order is now being filled. The New York, Providence & Boston Railroad Company has also placed a trial order.—*Boston Journal.*

Machinists' Supplies and Iron.

NEW YORK, April 29, 1886.

An unsettled feeling prevailed during the past week, caused, probably, by labor troubles.

Iron—In American pig the market has been dull. The demand has slightly fallen off. Standard, Lehigh and North River, $18.00 to $19.00; No. 1 X, Foundry, $17.00; Grey Forge, $16.00 to $16.50.

Scotch Pig—We quote Coltness, $20; Glengarnock, $19; Gartsherrie, $19.50; Summerlee, $19.50; Eglinton $17.50; Langloan, $19.50, and Dalmellington, $18.50.

Copper—Dealers are making efforts to maintain prices, but they find but little demand. Lake has sold in small lots at 11c.; other brands, 10⅛c. to 10½c.

Antimony—Hallett's, 8.50c.; Cookson's, 9⅛c., with sales at slightly lower figures.

WANTED

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Wanted—Head draftsman, experienced in designing paper-making machines. Address Fourdrinier, care AM. MACHINIST.

Wanted—A position as foreman of boiler works; qualifications, energy and experience; references. Address Vulcan, AM. MACHINIST.

Wanted—Address of engine, machinery and supply house wanting salesman for South or West. Address "Vim," AM. MACHINIST.

Wanted—Foreman to take charge of machine shop employing about 75 men. Address "James," AM. MACHINIST.

Wanted—Draftsman, competent and reliable, with experience on tools, hoisting machinery, turbines, mining machinery, etc., desires engagement. Address Box 9, AM. MACHINIST.

Wanted—A competent man to manufacture fulminate of mercury and load cartridge primers. State age, experience, etc., with expectations. Address, box 7, AMERICAN MACHINIST.

Wanted—A first-class die sinker; one accustomed to sink dies for drop forgings, also make dies for press work; state experience and age; also give reference. Address Box 10, AM. MACHINIST.

Wanted—A mechanical engineer of experience, to take charge of our mechanical department. Address, with references, U. S. Cotton Harvester Co., Room 68, Cotton Exchange Building, N. Y. City.

Wanted—An experienced machinery salesman; must have a thorough knowledge of all classes of mining machinery, and a large acquaintance throughout the mining districts of the West; one who can put some money into the concern preferred. Address L., AM. MACHINIST.

✣ MISCELLANEOUS WANTS ✣

Advertisements will be inserted under this head at 35 cents per line, each insertion.

The Cyclone Steam Flue Cleaner has no equal. Crescent Mfg. Co., Cleveland, Ohio.

Light mach'y of all kinds built at short notice. Pennington & Mills, 8 Dey st., Jersey City Heights, N. J.

Send for estimates of high-speed compound engines for stationary and marine service. Crist Engine Works, 140 Baxter street, N. Y.

Useful information steam users and engineers 100 page book on care, etc., of boilers. Send 25 cents in stamps. J. N. Mills Pub. Co., 30 Vesey st., N. Y.

Special tools and machines for mfg. designed and built to order; mechanical and Patent Office drawings. Weston & Smith, Syracuse, N. Y.

For Sale Low—A valuable patent for machine shop business; large profits. Address Machine shop, AM. MACHINIST.

Boiler shop needed in a manufacturing town in New York State; excellent opportunity for a live man; advertiser willing to aid in securing orders. Address Box 8, AM. MACHINIST.

M. Martin, manufacturer, P. O. Box 285, New Brunswick, N. J., will contract for the manufacture of articles in brass and other metals (stamped or turned), and dies and tools for making same; also patent novelties, electrical inventions, special machinery castings, etc.; estimates cheerfully given.

Wanted—A partner with $8,000 or $10,000, or to sell our works, with tools, machinery, flasks, patterns and merchandise; business pays well, but want of capital to work to advantage is the cause of wishing to sell. Golden Bros., Columbus, Ga.

Wanted—Pattern maker and draftsman, with $2,000 or $3,000, to take an interest in an established engine, saw-mill and boiler works, to work under salary; the entire plant is new equipped with the best tools; has been in operation 2 years; books will show a dividend of 25 per cent.; located in a fine Southern town of 10,000 inhabitants; has the best of prospects for future business; machine shop, foundry and boiler shop operated by practical men, who are stockholders, and all workers; references required and given. For further particulars, address South, care AM. MACHINIST.

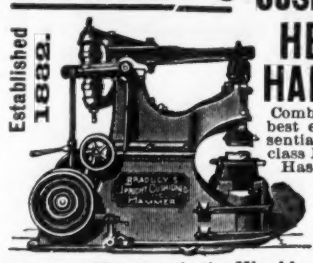
FOR SALE.

A Well-known Machine Shop in a Manufacturing City, NEAR BOSTON. Capacity, 30 Hands. Now MAKING MONEY. Death causes sale. Address,

EXECUTOR, care Am. Machinist.

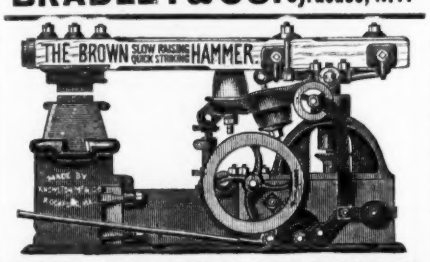
BRADLEY'S UPRIGHT CUSHIONED HELVE HAMMER

Established 1832.



Combines all the best elements essential in a first-class Hammer. Has more good points, does more and better work and costs less for repairs than any other Hammer in the World.

BRADLEY & CO. Syracuse, N.Y.



THE BROWN HAMMER

STRIKES A BLOW WITH DOUBLE THE VELOCITY That it Raises The Hammer.

A NEW MOVEMENT! SEND FOR DESCRIPTION.

KNOWLTON MFG. CO., King St., Rockford, Ill.

BEAUDRY'S UPRIGHT CUSHIONED POWER HAMMER.

By far the Best. Blow Accurate. Powerful and Elastic

Will Increase the Profits of any Shop.

BEAUDRY & CUNNINGHAM, BOSTON, MASSACHUSETTS.

H.W. JOHNS' ASBESTOS

Roofing, Building Felt, Steam Packings, Boiler Coverings, Fire Proof Paints, Cements, Etc.

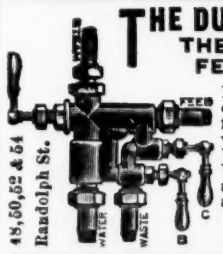
Samples and Descriptive Price Lists Free.

H. W. JOHNS M'F'G CO., 87 MAIDEN LANE, N. Y.

175 Randolph St., Chicago; 170 N. 4th St., Philadelphia.

THE DUPLEX INJECTOR

THE BEST BOILER FEEDER KNOWN.



Not liable to get out of order. Will lift water 25 feet. Always delivers water *hot* to the boiler. Will start when it is hot. Will feed water through a heater. Manufactured and for sale by

JAMES JENKS & CO., Detroit, Mich

PATENT UNIVERSAL SCREW-CUTTING, CENTER, DEPTH, ANGLE AND TWIST DRILL GAUGE.

J. WYKE & CO.

Fine Machinists' Tools, E. BOSTON, MASS. Send for Circular

STEPHENS PATENT PLANER CHUCKS

Combine valuable features offered by no other tool. In range of opening; advantage of self-adjusting jaw worked by a single screw; graduated base, etc. Parts interchangeable. Chucks guaranteed. Sold by the trade. Send for Catalogue.

Self-Adjusting.

MELVIN STEPHENS, Prop'r, Office, 41 Dey Street, New York.

FINE BUSINESS OPENING

For a Practical Machinist with a specialty to manufacture, together with a general jobbing business. We have a well equipped Machine Shop with tools and power to lease. Our large foundry adjoining can be rented if desired, with a fair business assured. One year's rent and probably more could be paid in machine work. Some financial aid given if necessary, to responsible parties with moderate capital. Good references required.

HARRIS MFG. CO., Rutland, Vt.

ANNOUNCEMENT!

We have just issued a new and very complete Illustrated Catalogue, which we will be pleased to mail to our patrons and others on application:

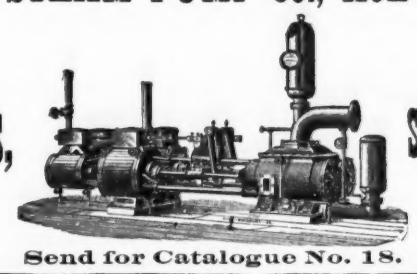
KNOWLES STEAM PUMP WORKS,

93 Liberty Street, New York,

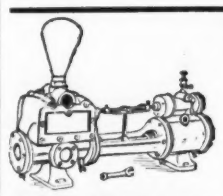
44 Washington Street, Boston.

THE DEANE STEAM PUMP CO., HOLYOKE, MASS.

BUILD WATER WORKS, ENGINES AND STEAM PUMPING MACHINERY.



Send for Catalogue No. 18.



SINGLE STEAM PUMP.

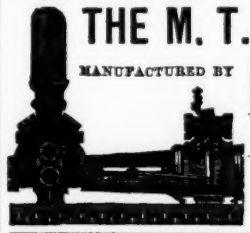
DELAMATER STEAM PUMPS

FOR ALL KINDS OF SERVICE.

Manufactured by C. H. DELAMATER & CO., (Delamater Iron Works)

Warerooms, 16 Cortlandt Street, New York.

THE M. T. DAVIDSON IMPROVED STEAM PUMP



MANUFACTURED BY

DAVIDSON STEAM PUMP COMPANY.

WARRANTED THE BEST PUMP MADE FOR ALL SITUATIONS.

PRINCIPAL OFFICE, No. 77 LIBERTY STREET, N. Y.

NEW ENGLAND OFFICE, 51 OLIVER STREET, BOSTON, MASS.

SHEPARD'S NEW $60 SCREW-CUTTING FOOT LATHE.

Foot and Power Lathes, Drill Presses, Scroll-saw Attachments, Chucks, Mandrels, Twist Drills, Dogs, Calipers, etc.

Lathes on trial. Lathes on payment.

Send for catalogue of Outfits for Amateurs or Artisans.

Address, H. L. SHEPARD, Agent, 134 E. Second St., Cincinnati, O.

OUR NEW CATALOGUE OF TOOLS

and Supplies sent free to any address on receipt of ten cents in stamps (for postage).

Chas. A. Strelinger & Co., Wood Ave., Detroit, Mich

FOR SALE AT A BARGAIN.

A well established and good paying machine shop and foundry, including buildings, lots, machinery and stock, situated in Leadville, Col. The business will be carried on until sold, thus at once giving a profitable trade to the purchaser. Address,

A. FALKENAU,

Care of Dickson Mfg. Co.,

Scranton, Pa.

Only reason for selling, ill health.

DRAWING INSTRUMENTS

Send for 72-Page ILLUSTRATED CATALOGUE.

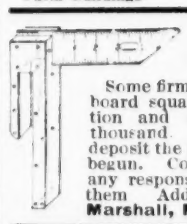
WM. T. COMSTOCK, 6 Astor Place, - New York.

STEWART'S PATENT READY ROOFING

For ROOFS OF ALL DESCRIPTIONS, steep or flat, can be applied by ordinary workmen having no previous experience. Send for Samples and Illustrated Pamphlet. Address

W. H STEWART, 74 Cortlandt Street, New York.

IRON FIBRE PAINT, for Roofs and Factory and Farm Buildings.



WANTED!!

Some firm to manufacture my weather-board square. I will send full description and drawings for estimate per thousand. Will give good reference and deposit the money in Bank when work is begun. Correspondence solicited with any responsible parties that can make them. Address W. F. SEARGEANT, Marshall, Mo.

GUILD & GARRISON,

BROOKLYN, N. Y.

STEAM PUMPS, VACUUM PUMPS, AIR COMPRESSORS,

NEW CATALOGUE NOW READY.

EMERY-WHEEL TOOL GRINDER.

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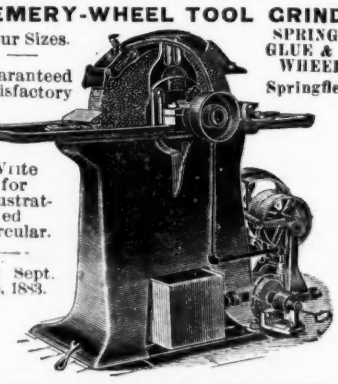

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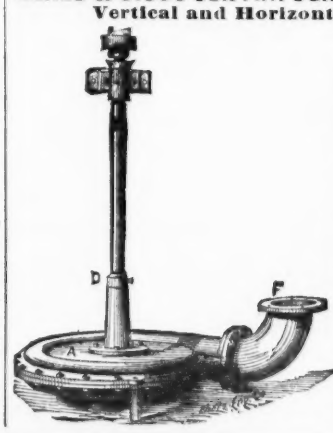

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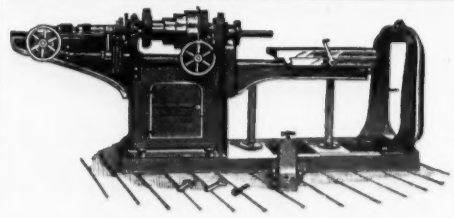

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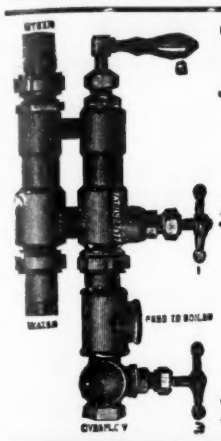

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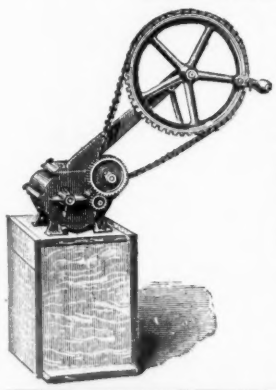

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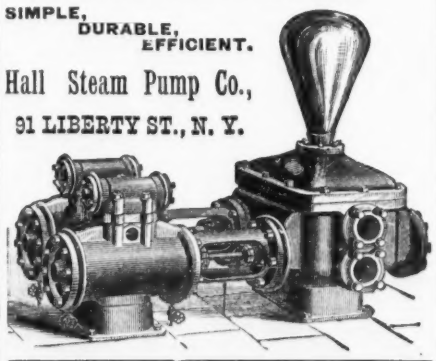

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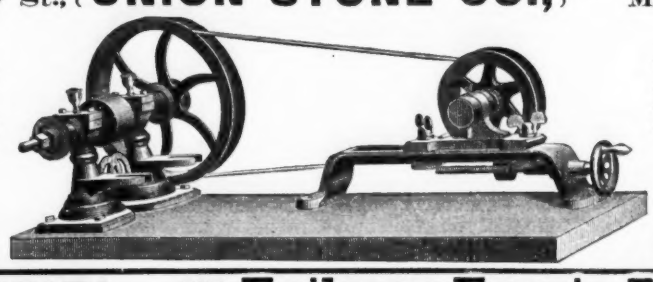

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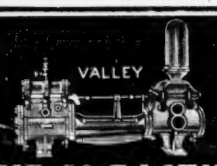

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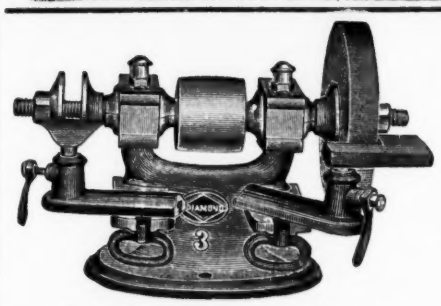

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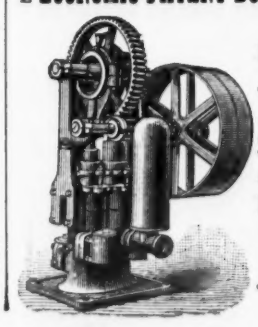

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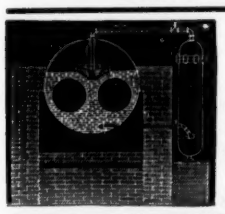

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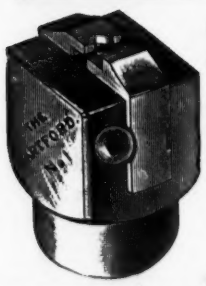

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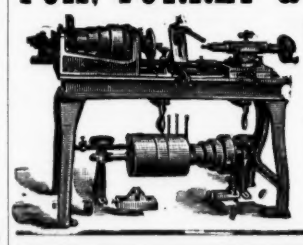

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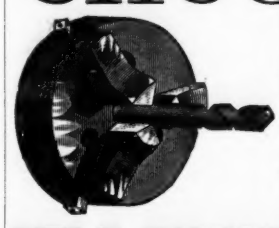

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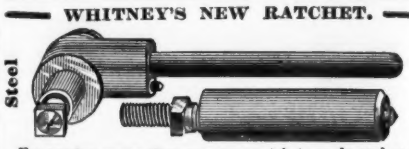

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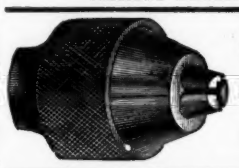

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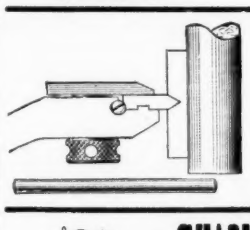

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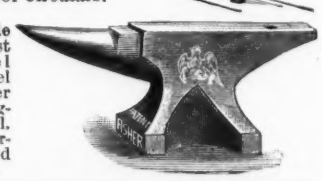

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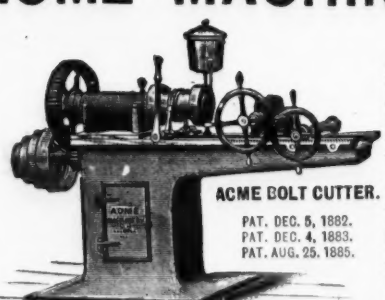

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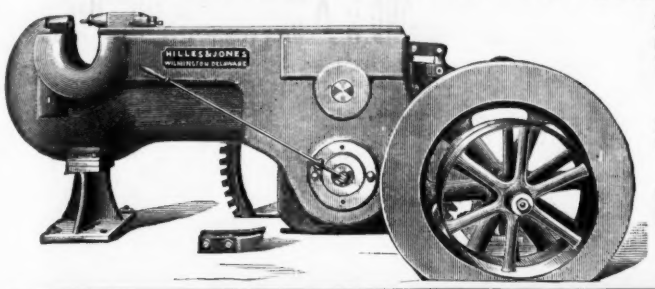

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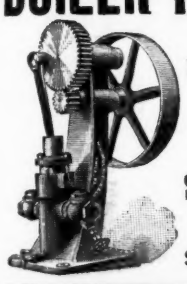

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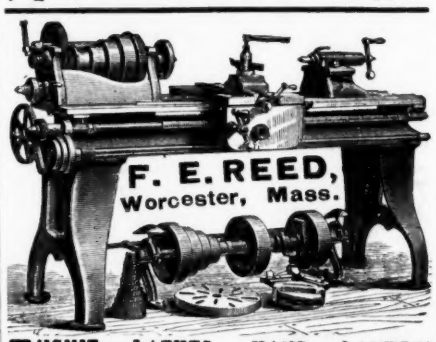

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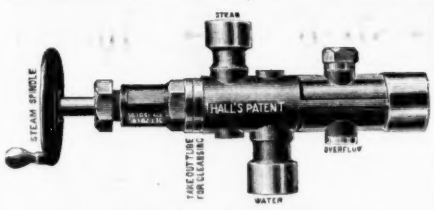

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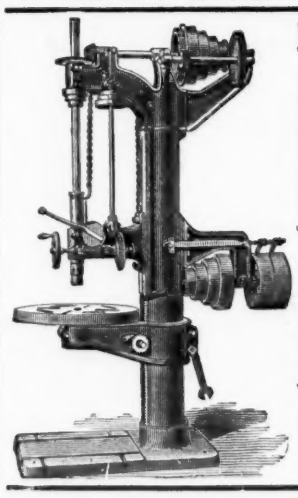

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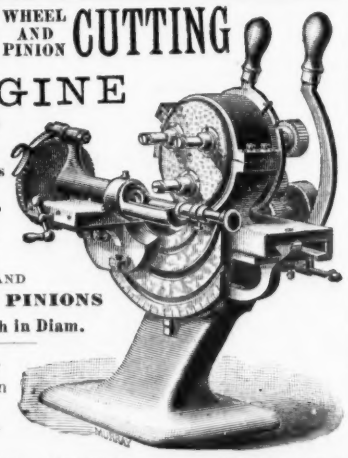

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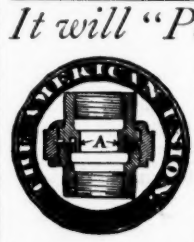

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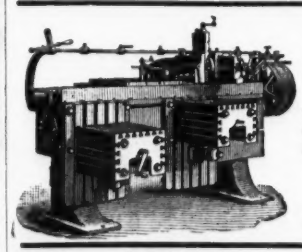

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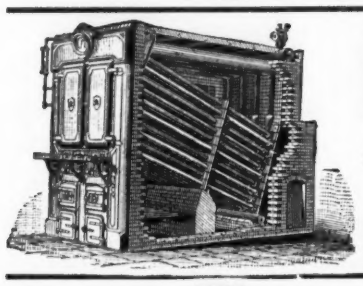

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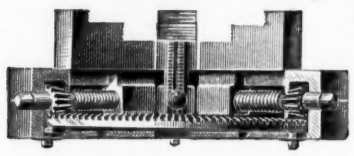

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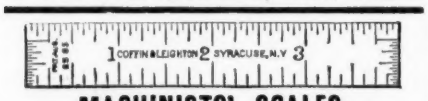

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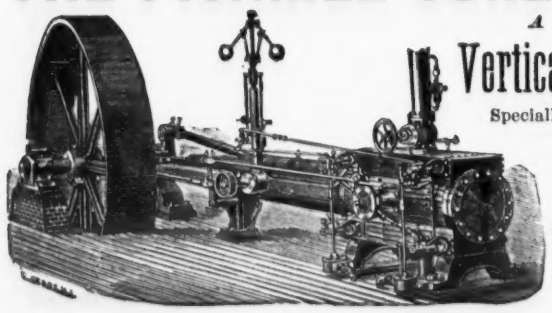

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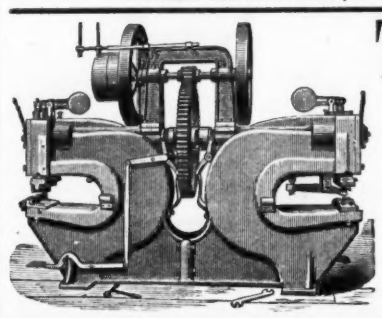

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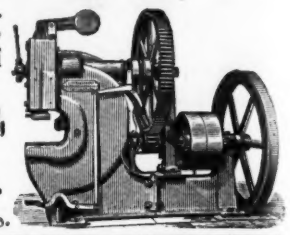

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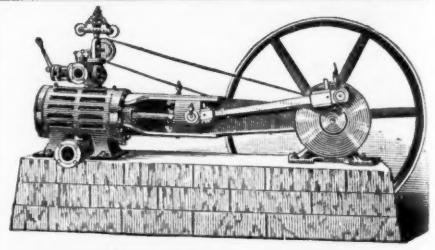

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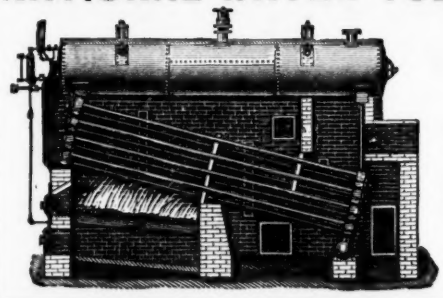

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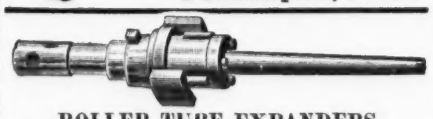

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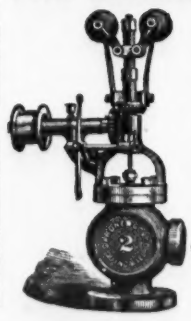

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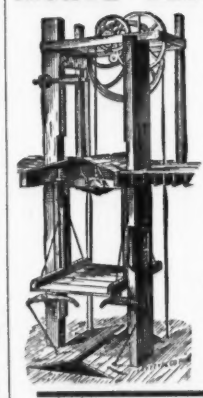

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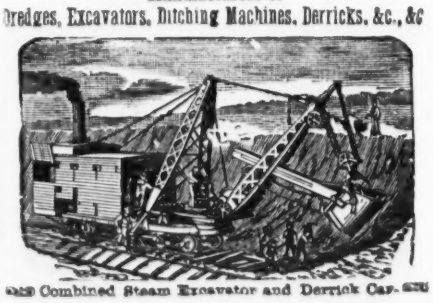

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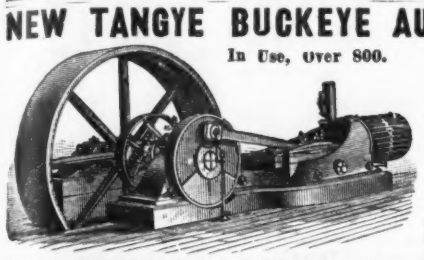

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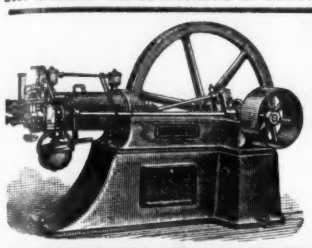

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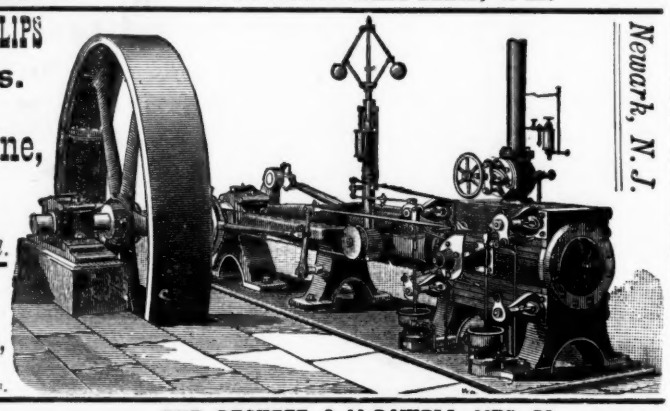

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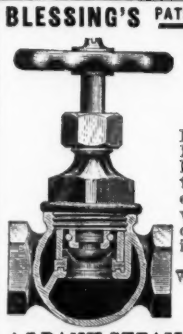

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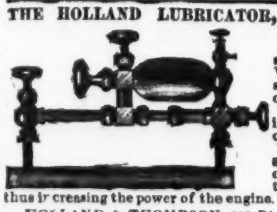

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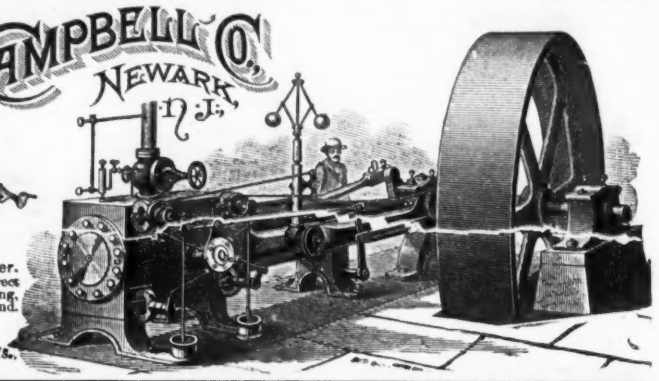

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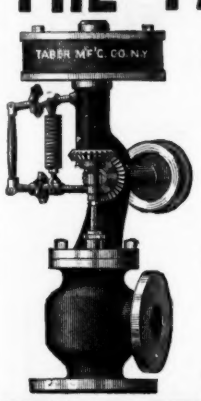

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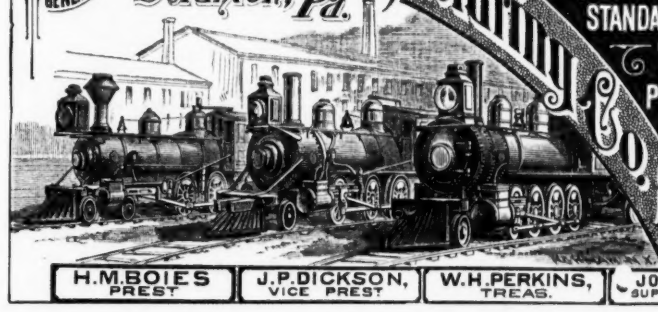

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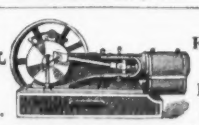

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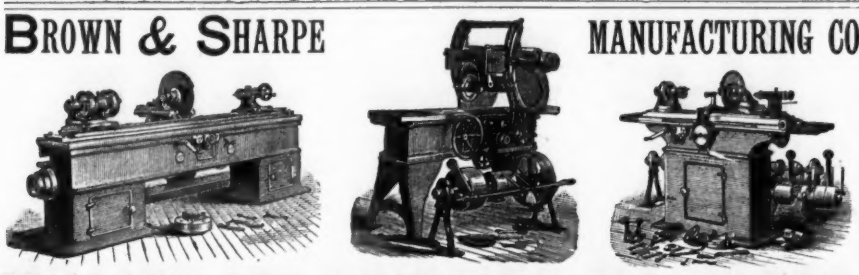

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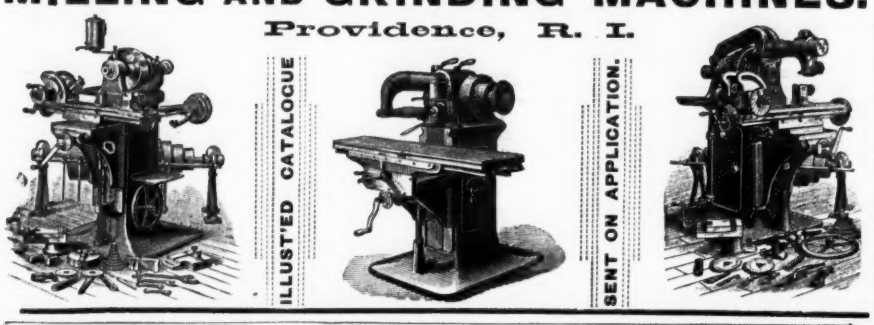

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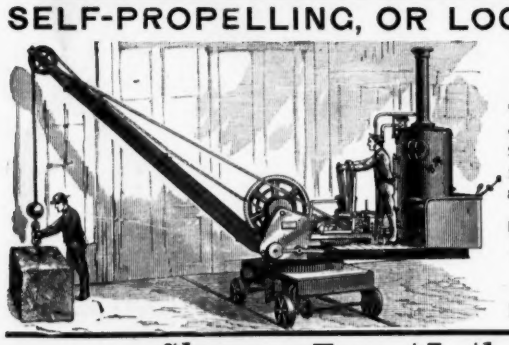

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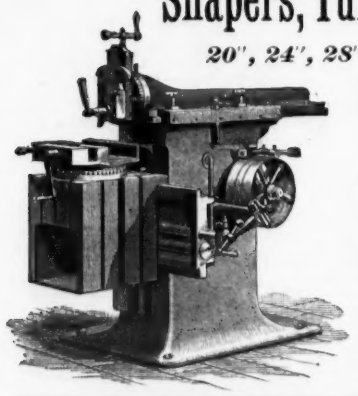

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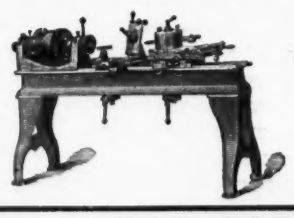

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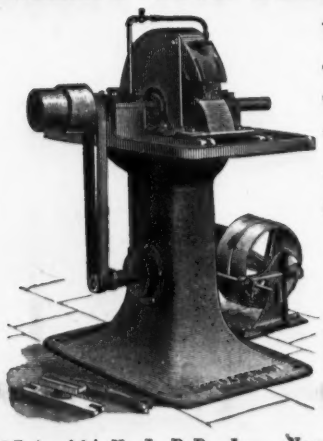

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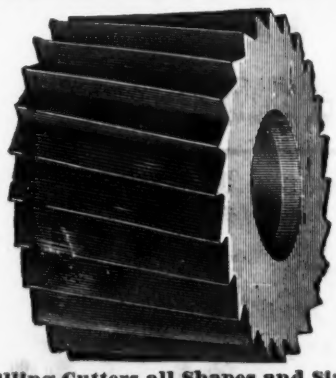

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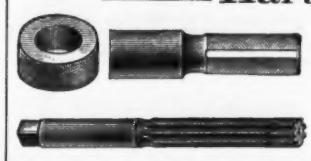

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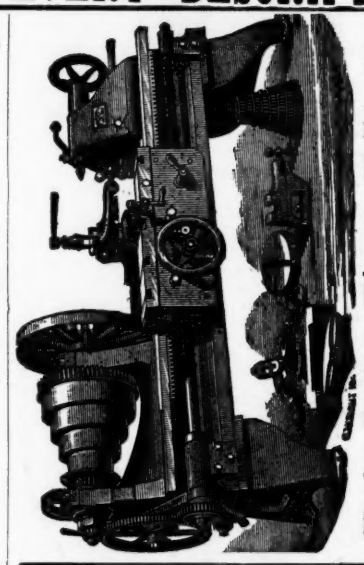

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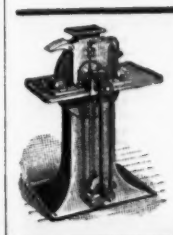

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